diesel power

September 1957

behind these generators...

WELL-LUBRICATED POWER

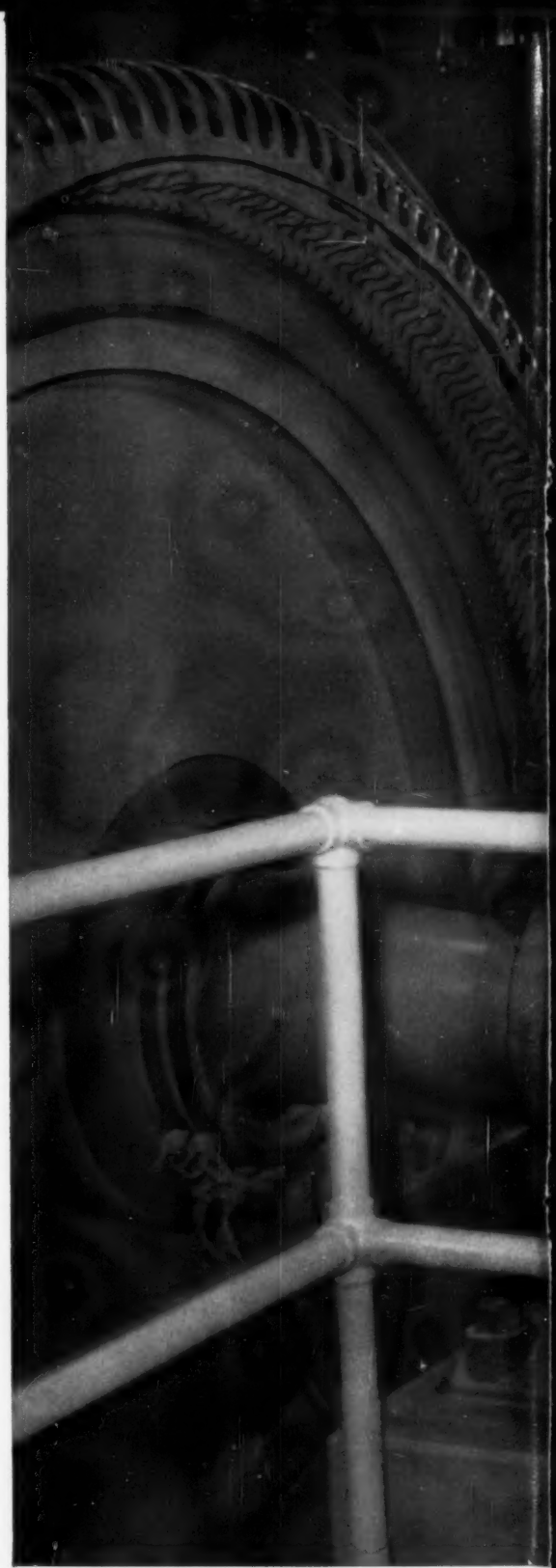
The powerful drive of today's modern engines depends upon the smooth functioning of every part. *Texaco Ursa Oils* help diesel, gas, and dual-fuel engines deliver their full rated power year after year by guarding against harmful deposits and keeping rings and valves free. This means full compression and complete combustion. Power output stays high, fuel consumption and maintenance costs stay down.

Texaco Ursa Oils—a full line to meet every need—are especially refined to assure *more power* with *less fuel* and *longer periods* between overhauls.

- **For over 20 years, more stationary diesel horsepower in the U.S. has been lubricated with Texaco than with any other brand.**

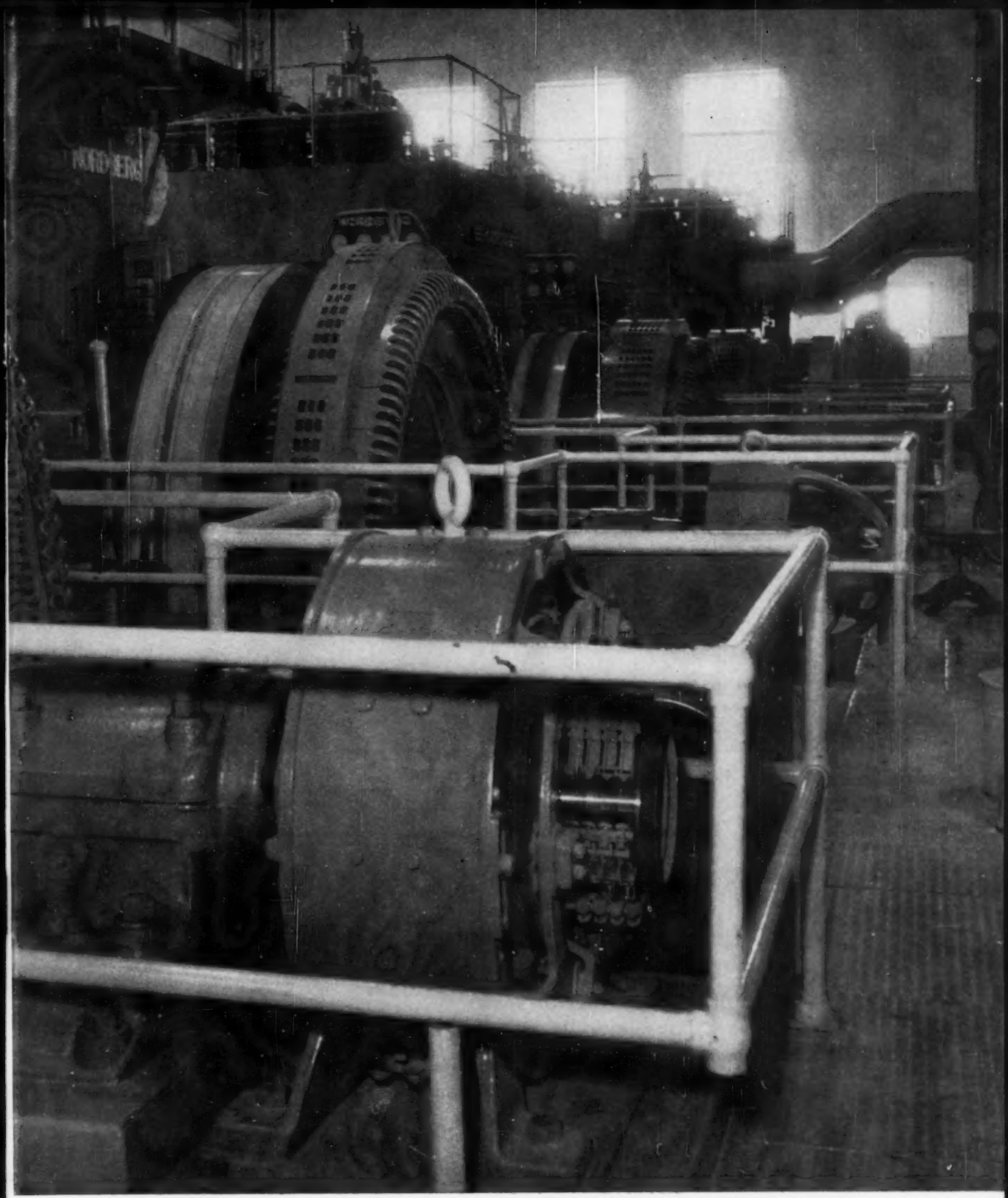
Your Texaco Lubrication Engineer offers his years of experience in helping you select the right Texaco Lubricant for your needs. You can contact him by calling the nearest of the more than 2,000 Texaco Distributing Plants, or by writing:

The Texas Company, 135 East 42nd Street, New York 17, N.Y.



TEXACO

TEXACO



URSA OILS

FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

This Allis-Chalmers 197-hp diesel "matches the needs" for tough excavator service in the Bucyrus-Erie 2½-yd 54-B.

ALLIS-CHALMERS ENGINES MATCH YOUR NEEDS

MATCH YOUR PERFORMANCE STANDARDS — with Allis-Chalmers high-torque, high-usable-horsepower engines that *stay on the job.*

MATCH YOUR POWER REQUIREMENTS — from a wide range of sizes and types, 9 to 516 hp. Specify or install them in *all* your equipment.

MATCH YOUR FUEL SITUATION — There are Allis-Chalmers engines for any fuel you choose — diesel, LP gas, natural gas, or gasoline.

MATCH YOUR SERVICE NEEDS — with close, fast parts and service, wherever you are. Your Allis-Chalmers engine dealer has a full stock of parts, factory-trained servicemen and complete facilities to give you prompt service in his shop or on your job.

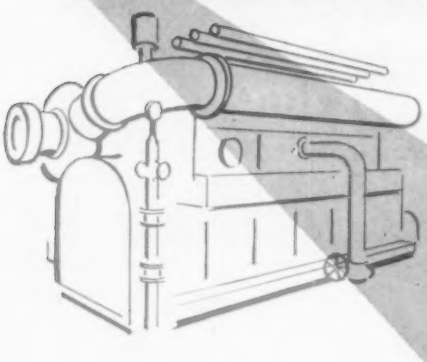
See your Allis-Chalmers dealer for full information on engine power and service matched to your needs. Allis-Chalmers, Buda Division, Milwaukee 1, Wisconsin.

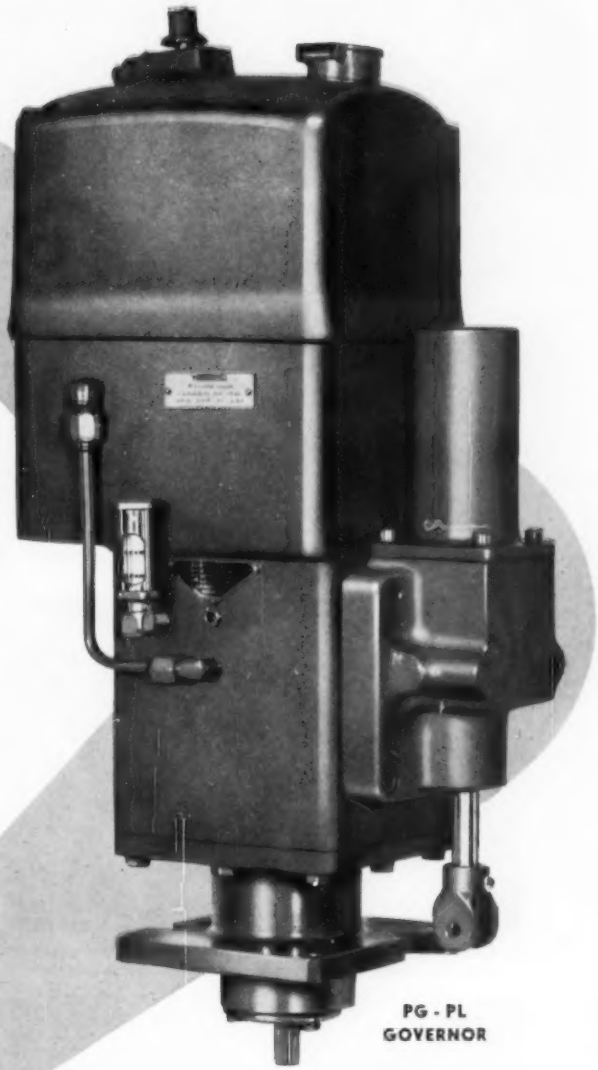
BC-8 A

ALLIS-CHALMERS *Engineering in Action*

WOODWARD GOVERNORS

For Diesel Driven Pumps and Compressors





PG - PL
GOVERNOR

The Woodward PG-PL Governor is one of many special purpose variations of the basic Woodward PG Governor. It was first used on pipelines but its use is now much more general.

When automatic control of engine speed setting is desired the PG-PL Governor is superior in most ways to other methods of automatic speed setting. The use of the PG-PL Governor is also advised for manual remote speed setting in locations where the use of electrical devices is prohibited. It is also advantageous for sugar mills, marine engines and other special applications.

Receiving its control air pressure from a suitable air controller the PG-PL Governor will control an engine at any speed necessary to maintain constant output-pressure, suction pressure, differential pressure, flow, suction pressure (with an override if discharge pressure becomes excessive), and any other quantity that can be measured by air controllers. The same air signal can adjust several engines simultaneously.

The PG-PL Governor is suitable for completely unattended operation if desired. Special modifications are available for hard to control engines. Woodward engineers are always ready to help you solve difficult problems of control.

WRITE FOR DETAILS ON OUR UNIT EXCHANGE PLAN

Give serial number of typical governor when requesting any information.

WOODWARD GOVERNOR COMPANY

ROCKFORD, ILLINOIS

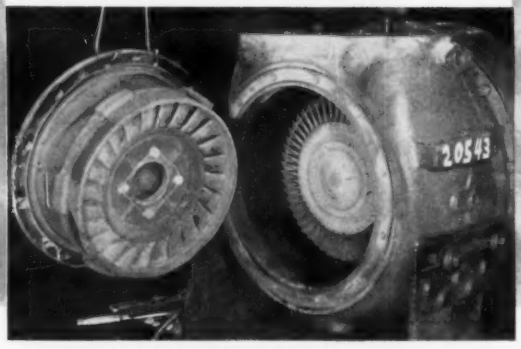
Fort Collins, Colorado — Schiphol, The Netherlands

WORLD'S OLDEST AND LARGEST MANUFACTURER OF HYDRAULIC GOVERNORS EXCLUSIVELY

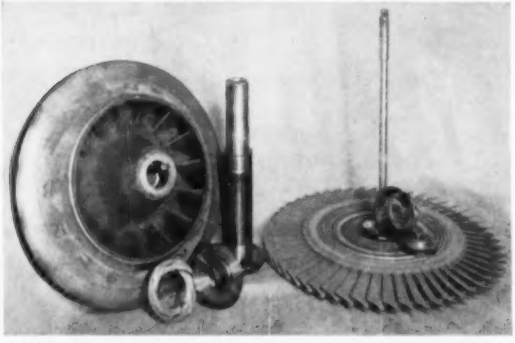
after 35,000 hours of service... this ELLIOTT turbocharger is still in good running condition

(It operated continuously—24 hours a day—for four years)

Inspection (of the blower end) by turbocharger engineer reveals remarkable condition even after four years service.



A view of the turbine end of the Elliott turbocharger shows only slight erosion on the turbine blades and nozzle ring.



After complete disassembly, inspection of the rotors revealed little or no evidence of wear on the journals, thrust faces, and bearings.

dependable operation with ELLIOTT turbochargers!

for two-cycle and four-cycle diesel engines
175 hp and up

Here's what happens to Elliott-engineered turbochargers under continuous 'round-the-clock operation. Serving gas-engine compressors in a midwestern pipeline compressor station, this turbocharger was originally installed four years ago. When shut down and returned to the Elliott plant for inspection, it was found to be in good running condition after *35,000 hours of service.* This outstanding record of dependable service is further proof of Elliott's superior design and workmanship. That's why it pays to specify Elliott for all turbocharger requirements.

ELLIOTT Company
Turbocharger Department
JEANNETTE, PENNSYLVANIA

M7-2

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James E. Jones
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W. Bryant
Production Mgr.

Walter Miles
Art Director

M. D. Pugh and Associates
Pacific Coast Representatives
P.O. Box 32188
Los Angeles 32, Calif.
Tel. Capitol 2-8857

Wynn Ruff
Mid Western District Manager
360 N. Michigan Ave.
Chicago 1, Illinois
Tel. Franklin 2-7872

Newspaper Representation Ltd.
British Representative
231 Strand,
London, W. C. 2, England

Georg J. Linder
German Representative
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diesel power

Established in 1923 Vol. 35, No. 9 September, 1957

The Magazine of Piston and Turbine Power

Editorial

Power for Protection 27

Articles

Packaged Units Pump Middle East Oil 30
Recognize the "Why" of Gear Failures 32
Detroit Diesel's 71E and 71T Engines for Trucks and Buses 36
Paper Wipers Help Reduce Maintenance Costs 38
Diesel Power Processes Uranium 39
Guide for Timing Gear Alignment and Clearance 41
Tractor Converted to Wagon Drill 42
Radioactive Lube Oil Speeds Engine Research 43
You Can Get Better Fuel Mileage 44
Diesel Development Delivers Savings 47
Simple Cooling System Maintenance 48
Diesel Rig Travels Far and Fast to Drill Deep 50

Departments

Highlights 29
Service Section 51
News of Our Industry 52
New Products 56
Organizational News 60
New Literature 64
Advertising Index 78

Diesel Publications, Inc., 80 Lincoln Avenue, Stamford, Conn.

The Engineer's Report

CASE HISTORY
RPM Delo Oil R.R.
LUBRICANT

Western Pacific R.R. Co.,
FIRM

Special oil maintains high average mileage record!

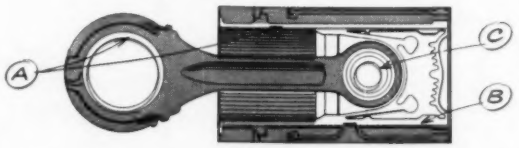
1776 CYLINDER ASSEMBLIES make up the 111 diesels in road freight service on the Western Pacific R.R. These units, as well as all passenger locomotives on the line, are lubricated with RPM DELO Oil R.R. Maintenance records of several years on freight locomotives show following average actual miles on parts removed for any reason: wristpins and bushings, 413,675 miles; pistons, 376,018 miles; liners, 354,101 miles. A representative assembly is shown in insert, just as it appeared after 476,497 actual freight miles. Note cleanliness of parts and free rings—typical of Western Pacific's experience with RPM DELO Oil R.R., the standard on the line since 1949.

FOR MORE INFORMATION about petroleum products of any kind or the name of your distributor, write or call any of the companies listed below.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U. S. PAT. OFF.

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

Harrison Oil Coolers Take the Heat off Heavy-Duty Diesels!
Heat abandons ship . . . when Harrison's aboard! With a payload of 30 tons of halibut, it takes a mighty Detroit Diesel engine to power this fishing boat. And it takes a Harrison oil cooler to do the cooling job *and do it right!*
HARRISON KEEPS THIS TRAWLER COOL!
In fact, you'll find Harrison heat exchangers *in every line of industry . . . in every line of defense!* That's because you can depend on Harrison, with over 46 years' experience in design, research and manufacture, for top-quality heat-control products. If you have a cooling problem, look to Harrison for the answer.
HARRISON RADIATOR DIVISION,
GENERAL MOTORS CORP., LOCKPORT, N. Y.
NORTHERN LIGHT
TEMPERATURES MADE TO ORDER
GM GENERAL MOTORS
HARRISON

On its second fleet of 70 GP 9 locomotives

Illinois Central again equips diesels with Air-Maze oil bath filters

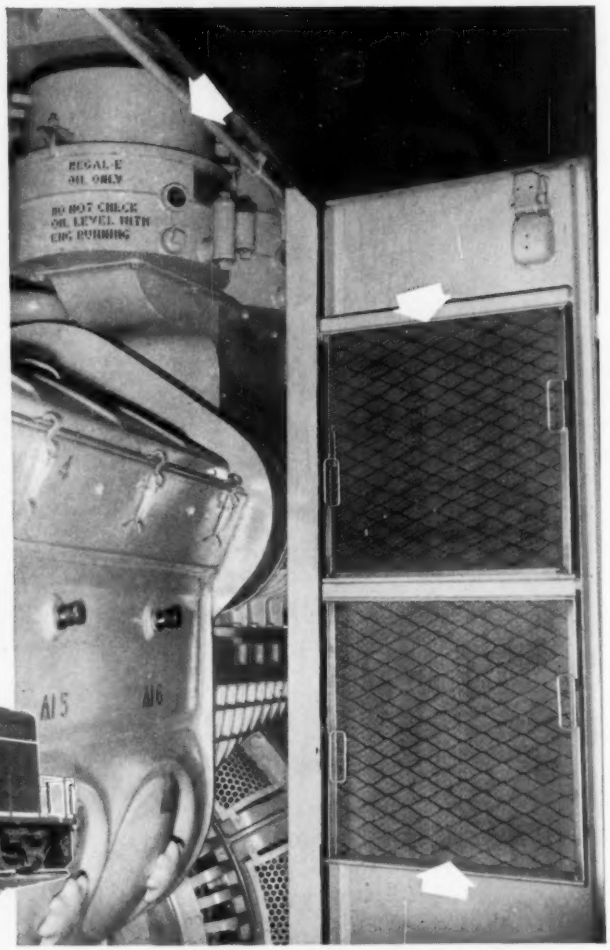
The reason is simple... longer wear from cylinder liners, pistons and rings; less cost for fewer repair parts and fewer maintenance manhours.

This is the record *after two years' testing* of oil bath filters on switchers, road switchers, and passenger locomotives.

And this is the reason why the second fleet of 70 diesels like the first fleet... 245,000 horsepower in all...is completely protected with Air-Maze oil bath filters.

Actually 59% more fine dust is removed by Air-Maze oil bath filters than the next best filtering device. And by filtering the air in a bath of oil, high filtering efficiency of the oil bath filter is maintained even at lowest engine speeds.

What's more, the oil bath filter operates 3 months or longer with minimum maintenance.



For information write your locomotive builder, or Air-Maze Corporation, Cleveland 28, Ohio, Dept. DP-9.

Oil bath filters *(upper left) maintains 92% efficiency or better in cleaning intake air in a bath of oil.*

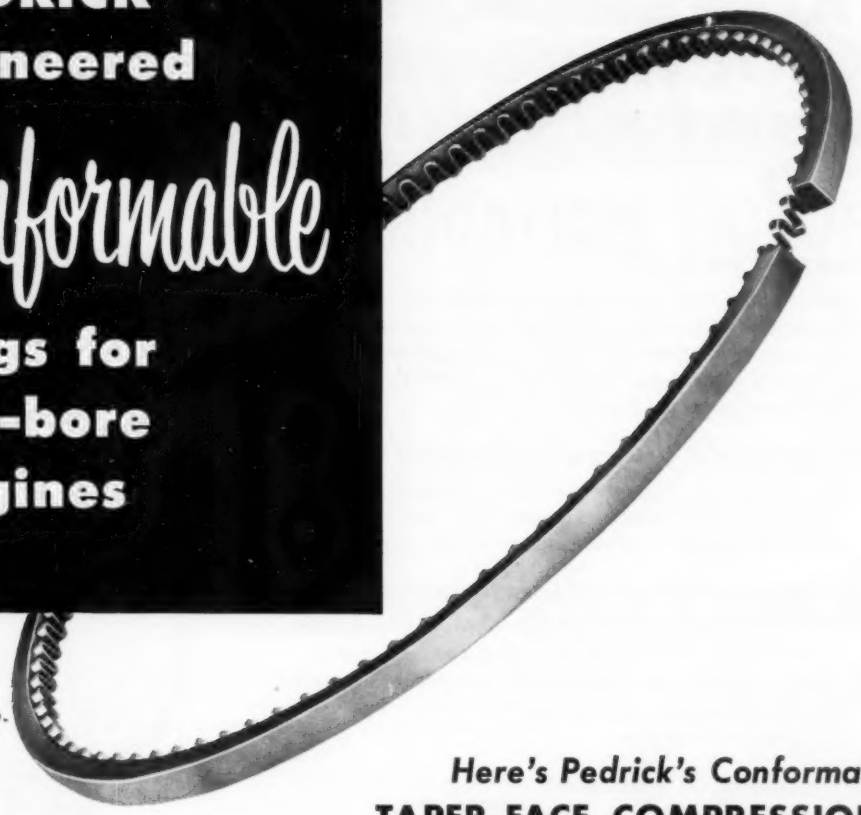
PSRR car body filter panels *(upper right) also used on this railroad to pre-filter air going to engine, traction motors, compressor, and generator.*

AIR-MAZE
The Filter Engineers

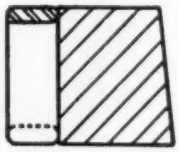
GEARED TO PROGRESS
P R I
MEMBER

ENGINE AIR FILTERS • CAR BODY FILTERS • LUBE OIL FILTERS • PASSENGER CAR FILTERS

PEDRICK pioneered *Conformable* rings for big-bore engines



U.S. Patent No. 2,771,329



TF7 DESIGN

This design is recommended especially for 4-cycle engines

Here's Pedrick's Conformable
TAPER-FACE COMPRESSION Ring

The big feature of the TF7 taper-face compression ring is its conformability under all kinds of cylinder conditions. Because of PEDRICK's exclusive "Equalizer," which exerts a positive and uniform pressure outward at every point around the ring circumference, the cast-iron section is radially thinner, and therefore more flexible.

The taper-face of this conformable compression ring provides a line contact with the cylinder wall for higher unit pressure, quicker seating and sealing and less chance of scuffing.

The TF7 ring is one of numerous modern designs used by PEDRICK engineers to *precisioneer* the very best combination of rings for maximum results in each particular installation. Take advantage of our Engineering and Consulting Service to help solve your ring problems. Write, wire or phone: WILKENING MANUFACTURING CO., Philadelphia 42, Pa. SAratoga 9-3770. In Canada: Wilkening Manufacturing Co. (Canada) Ltd., Toronto 2.

Pedrick® **PISTON RINGS**

AIRESEARCH TURBOCHARGERS ANSWER "YES!" TO...

increased power?

Your engine's output can be raised up to 100%, depending on its design and application. Incorporating the most efficient turbine wheels in the industry, AiResearch turbochargers can give sea-level performance up to 12,000 feet.

lower specific fuel consumption?

The turbocharger improves engine combustion, resulting in important fuel saving per horsepower even with greatly increased engine power output.

lower engine thermal loading?

Efficient compressor wheel design holds heat-producing turbulence to a minimum, providing a smooth flow of compressed air to the engine. AiResearch turbochargers are also air-cooled, eliminating the need for complicated plumbing.

less noise and smoke?

Engine noise level is greatly decreased. Smoking is often completely eliminated.

reliability and durability?

Excellent reports on more than 13,000 AiResearch units at work in the field emphasize these qualities. AiResearch turbochargers require no attention between normal engine overhaul periods.

Your inquiries are invited.

BASIC SPECIFICATIONS FOR AIRESEARCH TURBOCHARGERS					
MODEL	F-51	C-60	A-60	E-100	B-100
Output — lb/min. (Standard Conditions)	29-51	30-60	38-60	50-100	60-100
Diameter — in. nom.	10.0	11.5	15.25	15.1	15.4
Length — in.	10.5	12.9	16.75	14.7	17.1
Weight — lb.	40.0	95.0	125.0	112.0	135.0

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

DIESEL FUEL and LUBRICATION

BULLETIN

CITIES SERVICE

WHAT CAUSES LUBRICATION FAILURES?

The biggest single reason for lubrication failure is improper selection and application of lubricants.

Today's lubricating oils are made for highly specialized purposes. The fact that an oil seems ideal for the requirements of one piece of equipment is no guarantee of its qualifications for other machinery.

For example, choice of an oil with low detergency may result in stuck rings, excess cylinder wear, injector clogging, bearing wear and other diesel difficulties.

Next time you're considering what type of oil to use for a certain piece of equipment, call in a Cities Service Lubrication Engineer. He not only has the precise oil for the particular unit you want to lubricate, but may be able to simplify your entire lubrication picture and reduce maintenance costs as well.

USERS ACCLAIM CITIES SERVICE C-300 OIL

From a strip miner comes this report: "Shovel and dragline work 20 hrs. a day, seven days a week. Each have rolled up over 14,000 hrs. with no major overhaul, using Cities Service C-300 Motor Oil."

From a leading stone company: "Our six stationary diesels, powering our compressors and crushers, have averaged 12,000 hours each before major overhaul, with Cities Service C-300 Oil."

From a trucking company: "Our 20 diesels get up to 225,000 miles before overhaul with Cities Service C-300 Oil. We don't even grind the valves before then."

With excellent oxidation resistance, high detergency, and low carbon residue, Cities Service C-300 Oil may be the perfect lubricant for your machinery, too.

Get the facts from a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

USING A SULPHUROUS FUEL? TRY THIS NEW CITIES SERVICE OIL

If you're using a diesel fuel with high sulphur content, your motor oil must do more than its normal share of work to fight engine deposits.

Cities Service C-100 Motor Oil has been formulated for just this purpose. Under dusty, dirty, and sulphurous conditions, it provides excellent engine lubrication and protection. Talk with your Cities Service Lubrication Engineer for details.

MAN YOU SHOULD KNOW

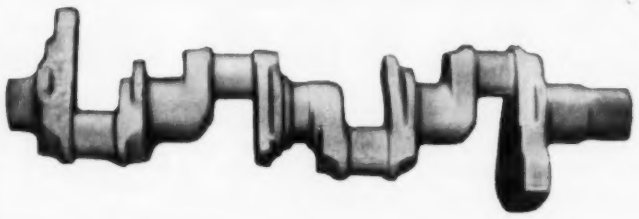
Barney Fleming is the Regional Manager of Industrial Oil Sales at the Cities Service office in St. Paul, Minnesota. With a background of 35 years as a lubrication engineer and a talent for solving problems, he is typical of the Cities Service engineering staff that's at your service. A call to the nearest Cities Service office will bring a member of this staff to your plant or job site.

whether you think in terms of

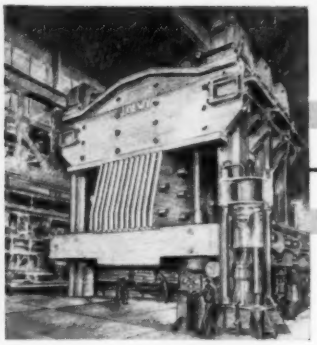
Horsepower

— or —

Thrust



The crankshaft is the backbone of the piston-type engine. Illustrated above is the crankshaft forging for the most powerful piston-type aircraft engine ever produced.



The history of Wyman-Gordon's contribution to aircraft progress dates from the inception of the "flying machine". The jet age is now calling on the unparalleled resources of Wyman-Gordon, which include the widest range of hammer and press equipment and the greatest technical know-how in the industry. Larger and more intricate forgings than heretofore available of aluminum and magnesium are being produced on presses up to 50,000 ton capacity, and giant hammers are fulfilling the growing need for forgings of titanium, high density materials or so-called super alloys. Now, as for nearly 75 years, there is no substitute for Wyman-Gordon experience and ability for — Keeping Ahead of Progress.

At the bottom left is a turbine disc forging made from high density heat resisting alloy, and next to it is a titanium compressor wheel forging for two of the most powerful jet engines yet produced.

WYMAN-GORDON COMPANY

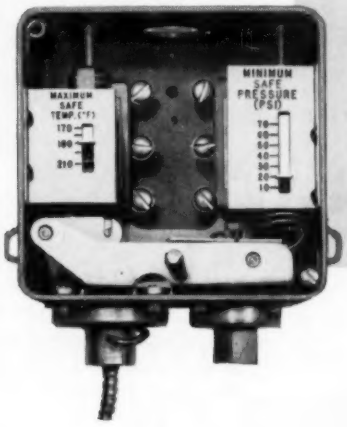
Established 1883

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM

WORCESTER 1, MASSACHUSETTS

HARVEY, ILLINOIS • DETROIT, MICHIGAN

Temperature and pressure set points are inside the case, protected against accidental manipulation. Cover is removed for easy adjustment.



New Diesel engine safety switch

...gives fail-safe protection

This all-new Honeywell safety switch responds to abnormal pressure or temperature to stop or idle a diesel engine, or actuate an alarm circuit.

It combines separate systems for measuring engine coolant temperature and lubricating oil pressure. The temperature system includes an exclusive fail-safe feature, so that in case of damage to its temperature bulb, capillary or diaphragm, the switch responds as it would to excessive temperature.

Temperature and pressure settings can't drift off set points. There can be no false shutdowns due to vibration. Set points are easily adjustable in the field.

Your nearby Honeywell sales engineer will be glad to give you complete information about the new Diesel Engine Safety Switch. Call him today . . . he's near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pennsylvania.

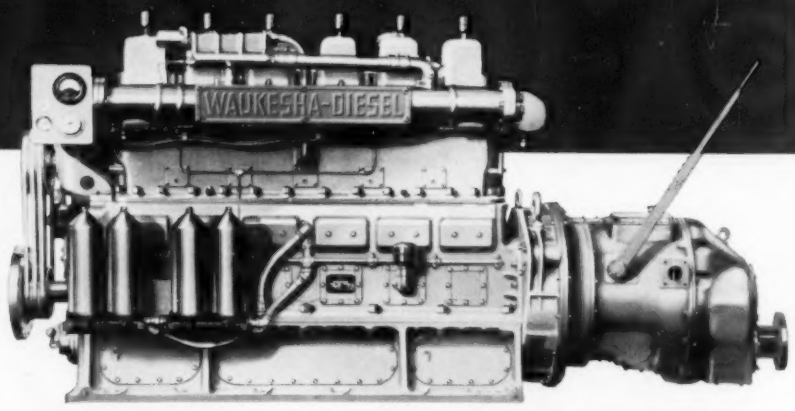
● **REFERENCE DATA:** Write for Specification sheet S1010-5 "Diesel Engine Safety Switch."

MINNEAPOLIS **Honeywell**
BROWN INSTRUMENTS
First in Controls

WAUKESHA Diesel

MARINE ENGINES up to 990 hp

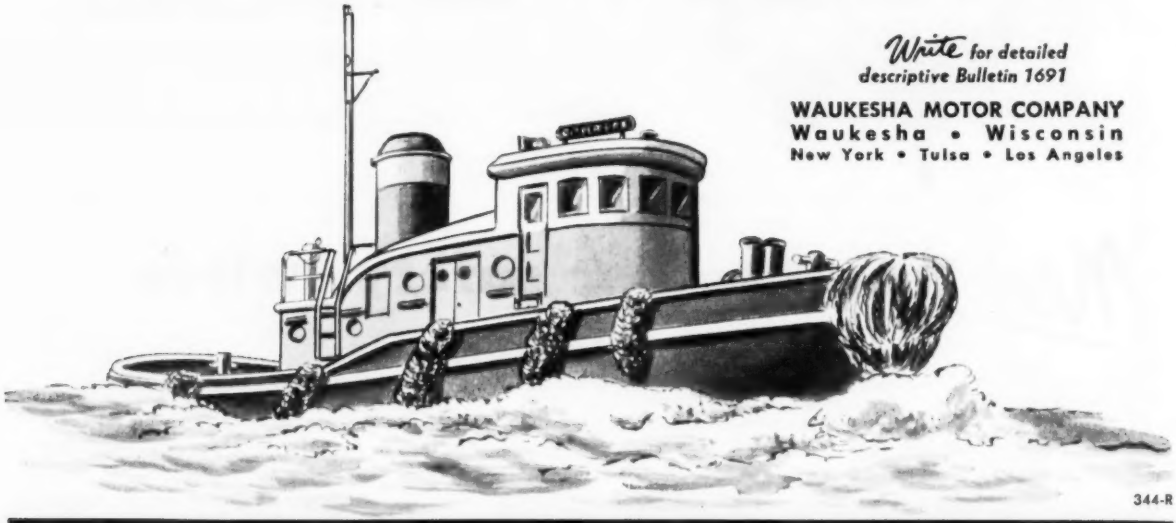
- EASY STARTING
- SAFETY
- SIMPLICITY
- SMOOTHNESS
- ECONOMY



DEFENDER (LRD Series) 2894 cu. in. Normal or Turbocharged DIESEL

Write for detailed descriptive Bulletin 1691

WAUKESHA MOTOR COMPANY
Waukesha • Wisconsin
New York • Tulsa • Los Angeles



344-R

WAUKESHA normal and turbocharged diesel marine engines

Engine Model	Engine Type	No. Cyls.	Bore and Stroke	Displ. Cu. In.	MAXIMUM RATING 24-Hour Duty
Reliance	Normal	12	8½ x 8½	5788	665 horsepower @ 1200 rpm
	Turbo	12	8½ x 8½	5788	990 horsepower @ 1200 rpm
Defender	Normal	6	8½ x 8½	2894	335 horsepower @ 1200 rpm
	Turbo	6	8½ x 8½	2894	480 horsepower @ 1200 rpm
Wanderer	Normal	6	7 x 8¼	1905	240 horsepower @ 1200 rpm
	Turbo	6	7 x 8¼	1905	315 horsepower @ 1200 rpm
Resolute	Normal	6	6¼ x 6½	1197	195 horsepower @ 1600 rpm
	Turbo	6	6¼ x 6½	1197	260 horsepower @ 1600 rpm
Vigilant	Normal	6	5¼ x 6	779	150 horsepower @ 1800 rpm
	Turbo	6	5¼ x 6	779	195 horsepower @ 1800 rpm
Cutwater	Normal	6	4¼ x 5	426	100 horsepower @ 2000 rpm
	Turbo	6	4¼ x 5	426	120 horsepower @ 2000 rpm

ON SHORTLINE AS WELL AS MAINLINE ROADS IT'S BENDIX FUEL INJECTION

All over the country shortline railroads like those listed here are giving 'round-the-clock service that helps make the American railroad system the envy of the world.

Using 70-ton and 95-ton General Electric road switchers powered by Cooper-Bessemer engines with Bendix* Fuel Injection Equipment, these shortline roads maintain high operating standards in the performance of their important work.

Bendix is proud that its fuel injection equipment has received such high endorsement from so many shortline railroad operators.

It furnishes further evidence that when dependable, efficient, and economical operation is a must Bendix is the logical choice for fuel injection equipment. SCINTILLA DIVISION OF BENDIX AVIATION CORP., SIDNEY, N.Y. EXPORT SALES AND SERVICE: BENDIX INTERNATIONAL DIVISION, 205 EAST 42ND ST., NEW YORK, N.Y. *REG. U.S. PAT. OFF.

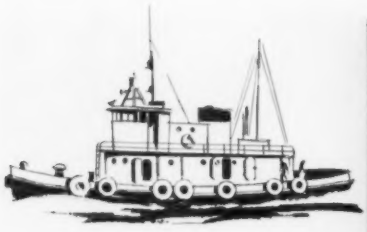
This Bendix pump and nozzle are used on the type of road switcher pictured above.

Partial list of shortline roads using Bendix Fuel Injection Equipment

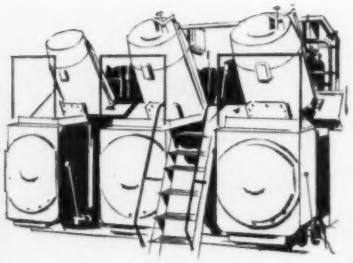
ALBANY & NORTHERN
ARKANSAS & OZARKS
BALTIMORE & ANNAPOLIS
BARRE & CHELSEA
BELFAST & MOOSEHEAD LAKE
COLORADO & WYOMING
DES MOINES & CENTRAL IOWA
EAST ERIE COMMERCIAL
FT. DODGE, DES MOINES & SOUTHERN
FRANKFORT & CINCINNATI
GEORGIA NORTHERN
GREENVILLE & NORTHERN
HAMPTON & BRANCHVILLE
LANCASTER & CHESTER
LIVE OAK, PERRY & GULF
MISSISSIPPI EXPORT
MOBILE & GULF
MUNCIE & WESTERN
NORTHAMPTON & BATH
RAHWAY VALLEY
SANFORD & EASTERN
SOUTH GEORGIA
TALLULAH FALLS
VALDOSTA SOUTHERN
WASHINGTON & OLD DOMINION

Scintilla Division

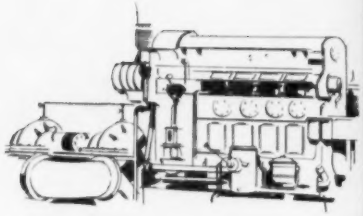
Bendix
AVIATION CORPORATION



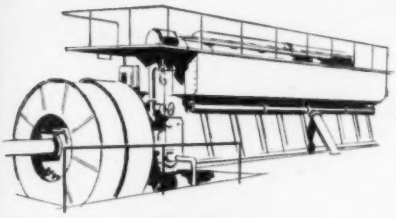
Marine



Engine compressor



Pumping



Stationary

GET THE BEST FROM THE POWER YOU BOUGHT...

WITH *Alnor*® PROTECTION

Accurate check of exhaust temperatures with an Alnor Pyrometer system can assure minimum fuel consumption per horsepower and long service from the power you bought—without the interruption of many common-cause breakdowns.

At a fraction of the cost of your present engine maintenance bill, an Alnor system can give you advanced warning of:

CYLINDER OVERLOAD	SCALED JACKETS	DETONATION
PREIGNITION	CLOGGED PORTS	FAULTY INJECTION

Series A Pyrometers are designed specifically for direct mounting on diesel engines or other equipment subject to vibration and rough usage. Readings are accurate to within + or −1%. Dustproof, fumeproof, splashproof. Switch capacities of 4, 6, 8, 10, 12 and 16 circuits. Other models to 31 circuits. Get full information—by return mail. Send for Bulletin 4361 with complete details of the Pyrometer and thermocouple assembly designed for your engine.

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write:

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Photo courtesy of General Dynamics Corp.

When the *Skate*, U. S. Navy's newest atomic submarine, slid down the ways, she was equipped with Fulflo Filters.

When you need dependable micronic filtration, you, too, can rely on Fulflo Filters. They are engineered to your exact requirements — for all types of industrial fluids: oils; liquid chemicals; water; liquid fuels; lacquers, paints, thinners; compressed air, CO_2 and other gases. Standard models meet all normal operating conditions. Special filters can be engineered for full-flow filtration up to 2000 gpm or pressures as high as 5000 psi, at minimum pressure drop. Wide variety of filter elements and containers is available.

Call on Commercial for dependable micronic filtration. For technical literature or engineering assistance, address Department DR.

Micro-Fine Filtration for Low Cost Clarity

COMMERCIAL FILTERS CORPORATION

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FULFLO FILTERS WITH GENUINE HONEYCOMB FILTER TUBES FOR CONTROLLED MICRONIC CLARITY • CFC MULTI-CARTRIDGE OIL FILTERS
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Opening the way to new engine control accuracy

Westinghouse electric governors actually predict speed changes . . . react faster than any other

Now, Westinghouse offers the fastest acting electric governor in history. It senses electrical load change . . . anticipates speed change. It is much faster acting than the conventional governor which must wait for actual speed change.

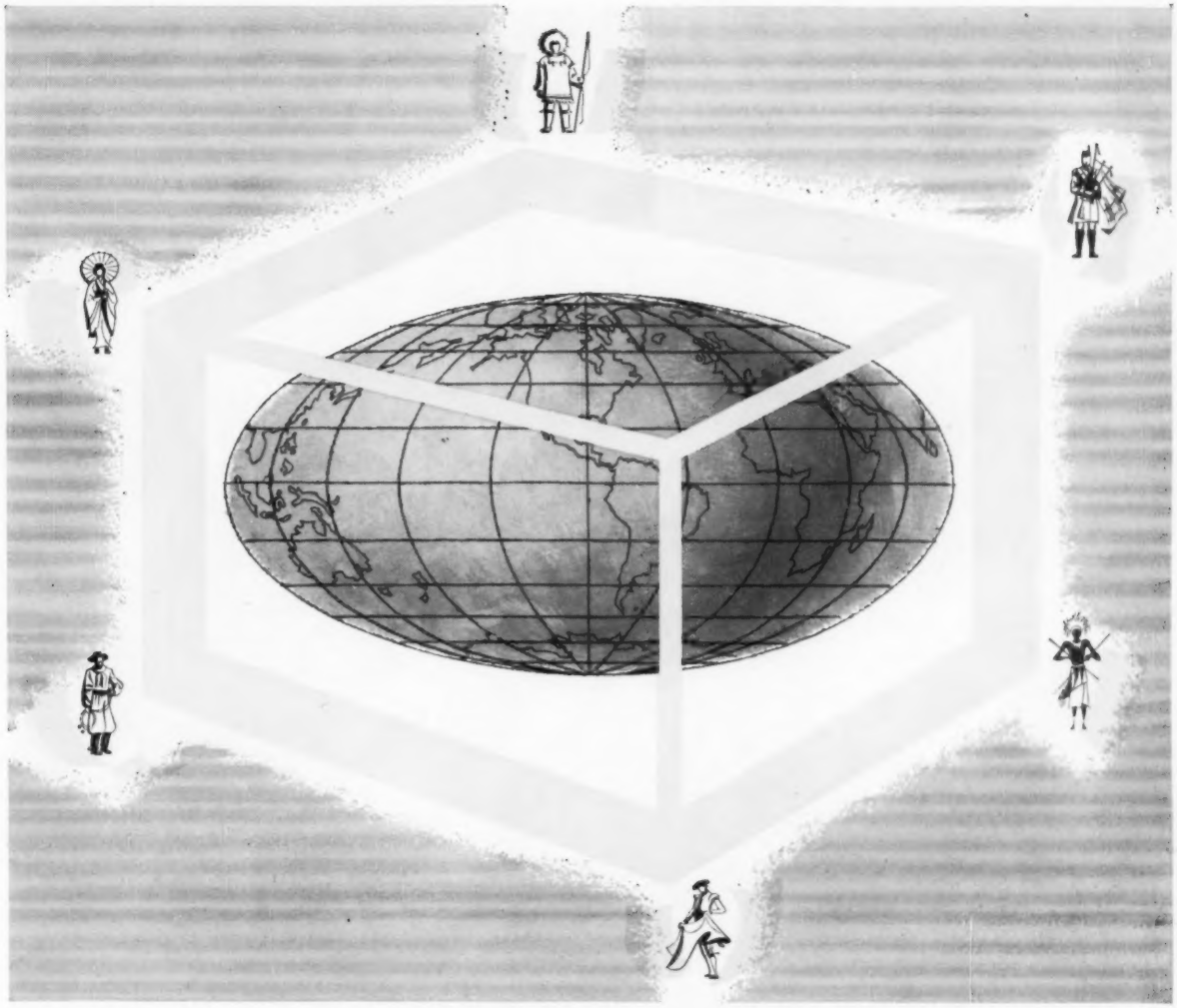
The Westinghouse electric governor also provides for automatic isochronous load sharing by two or more engine-generator sets. Electric frequency (speed) sensing, another prime feature in the Westinghouse electric governor, eliminates the need for expensive and troublesome mechanical speed-drive systems.

This accurate, dependable governor is easy to maintain . . . no tubes or other frail parts . . . operator attention is cut to minimum.

FOR ALL THE FACTS, write Westinghouse Electric Corporation, 3 Gateway Center, Pittsburgh 30, Pennsylvania. Ask for B-6757. J-22045

YOU CAN BE SURE...IF IT'S

Westinghouse



In the far corners of the globe...

The performance and the brand are the same around the world

Other outstanding Shell Industrial Lubricants

Shell Tellus Oil—for closed hydraulic systems

Shell Alvania Grease—multi-purpose industrial lubricant

Shell Turbo Oils—for utility, industrial & marine turbines

Shell Dromus Oil—cutting oils for high-production metalworking

Shell Talona R Oil 40—anti-wear crankcase oil for diesel locomotives

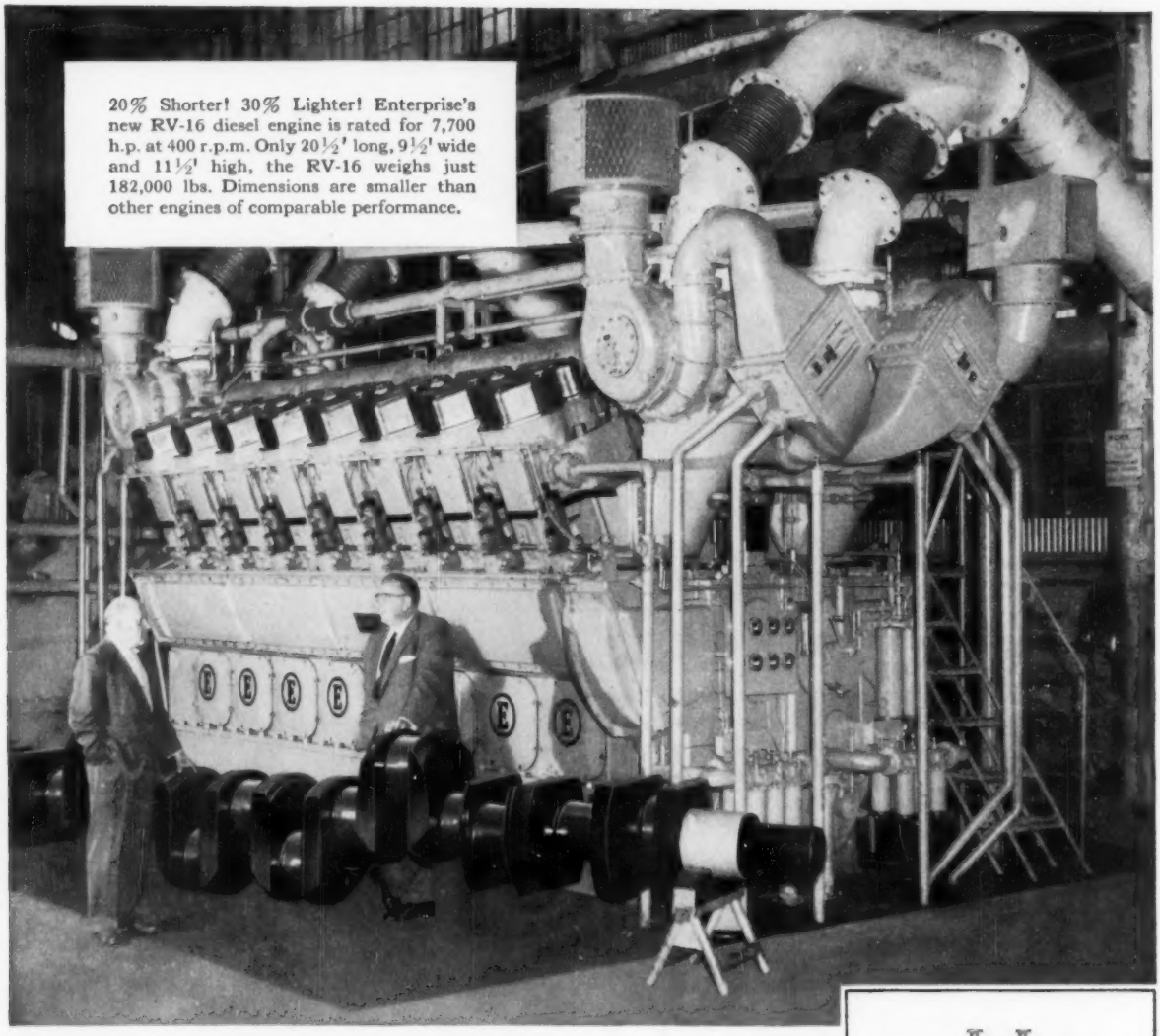
Shell Rimula Oil is a heavy-duty oil designed to solve the toughest lubricating problems in diesel engines.

Rimula® Oil reduces cylinder and bearing wear caused by acidic combustion products that are increased by low jacket temperatures. It remains stable under the widest temperature extremes encountered in modern operation. It keeps engine parts clean and operating efficiently over longer periods...effecting worth-while savings in labor and parts.

Rimula Oil, regarded in the U.S.A. by manufacturers and operators as an indispensable accessory to heavy-duty vehicular operation, is available to your customers abroad under the same brand. For full information, write: Shell Oil Company, 50 West 50th St., New York 20, N. Y., or 100 Bush St., San Francisco 6, Calif.

SHELL RIMULA OIL

SHELL



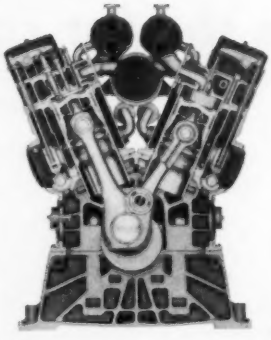
20% Shorter! 30% Lighter! Enterprise's new RV-16 diesel engine is rated for 7,700 h.p. at 400 r.p.m. Only 20½' long, 9½' wide and 11½' high, the RV-16 weighs just 182,000 lbs. Dimensions are smaller than other engines of comparable performance.

Enterprise Chooses KOPPERS Piston Rings Exclusively for RV-16

Prototype of a new line of industrial diesel engines, the RV-16, built by Enterprise Engine & Machinery Co., of San Francisco, is designed for such rugged operations as delivering main propulsion in towboats and seagoing freighters, or supplying power for pumping stations or electric generation.

As many other leading manufacturers have done, Enterprise has selected Koppers Piston Rings exclusively. Koppers wide range of types and sizes . . . variety of material selection . . . control of material quality . . . close tolerance performance . . . rigid standards of inspection—all contribute to Koppers leadership in the field of industrial piston and sealing rings, making Koppers the most dependable source of supply.

If you have a problem of ring application, avoid further needless expense. Take advantage of Koppers experience, research facilities and craftsmanship. Write for information today. KOPPERS COMPANY, INC., Piston Ring and Seal Department, 1309 Hamburg Street, Baltimore 3, Maryland.



Cutaway shows internal design of the RV-16

KOPPERS

AMERICAN HAMMERED

Industrial Piston Rings

Engineered Products Sold with **Service**

Engines for this fast new fireboat are protected by Purolator filters

Diesels on Baltimore's powerful new fireboat easily push it along at a snappy 17 mph while it discharges 12,000 gallons of water every minute. But if dirt brought in by even the cleanest fuel supply should ever get into the engines, this outstanding speed and power would quickly suffer . . . and expensive repairs would follow. That's why Purolator fuel and by-pass lube filters are included as original equipment on all engines in the ship.

It pays for you to use Purolator filters in your diesel lube systems, fuel lines and fuel injection system. And you can't improve on Purolator Micronic® filtration because the micronic element is made of plastic-impregnated cellulose which makes it waterproof, warp-proof and unaffected by engine temperatures or crankcase dilution. It filters particles so small they can be measured only in microns — .000039 inch.

Filtration For Every Known Fluid

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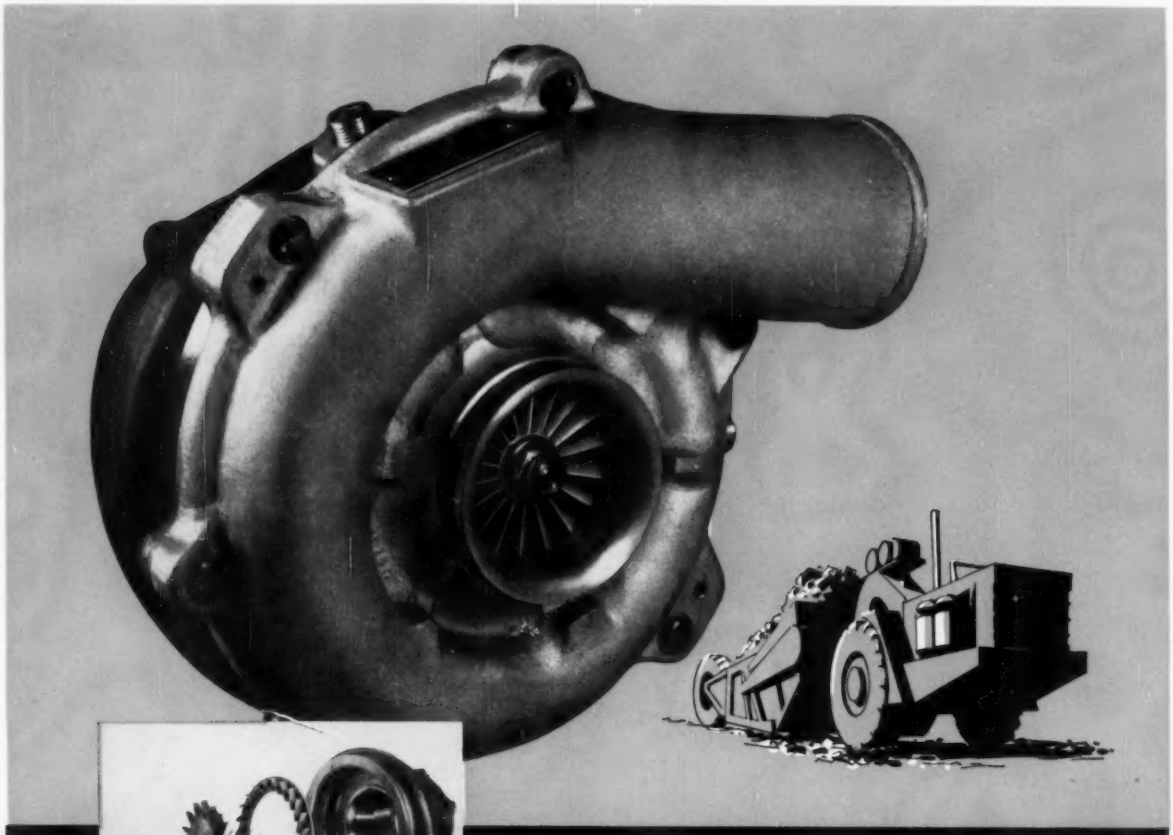
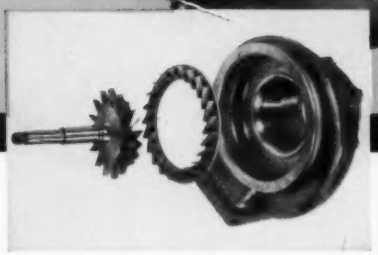




NEW! Rugged Turbine Design

Means Less Maintenance with Thompson Turbochargers

Turbine parts on new Thompson Turbochargers are crack- and corrosion-free, thanks to use of a heat-resistant alloy and close attention to design! Built to withstand turbine inlet temperatures of over 1500 degrees, the Thompson turbine is designed to deliver a minimum of 10,000 hours of trouble-free service. Studs have been eliminated from this high temperature section for easier installation and longer life.

You'll find other advanced features in the bearing and compressor sections of new Thompson Turbochargers. Careful location of simple, one-piece bearing has resulted in high critical speeds at smaller shaft diameters. Straight rotor vanes simplify compressor design, maintain highest efficiencies at lower rotor speeds.

Let our engineers show you how you can economically increase the horsepower of your diesel engines up to 100%. New Thompson Turbochargers are available in sizes to efficiently blow diesels from 50 to 300 horsepower.

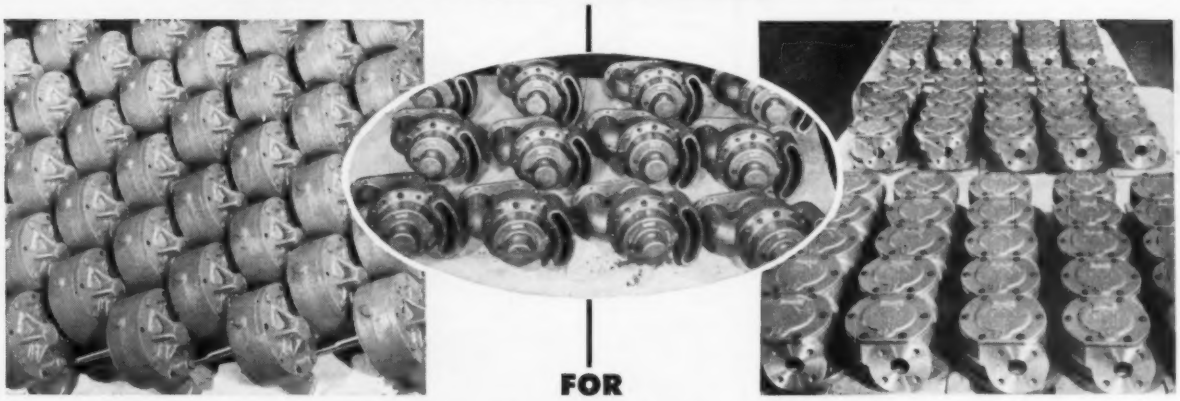
Write on your company letterhead for Booklet DP-357, containing detailed information on Thompson Turbochargers.

JET DIVISION

Thompson Products, Inc.

Cleveland 17, Ohio

NEW TUTHILL BRONZE PUMPS



FOR

Marine Lubrication, Hydraulic Power Transmission, Liquid Transfer and Other Services

Wide Range of Models and Mountings

To meet the requests of the maritime industry, TUTHILL is now supplying a wide range of standard pumps with bronze housing, packing glands, covers and brackets. Here are some of their advantages:

1. MEET GOVERNMENT SPECIFICATIONS
TUTHILL Bronze Pumps fulfill government specifications for marine service, including shock resistance and other advantages of bronze construction. In addition they offer the rugged durability provided by steel gears.

2. PROVEN DESIGN
They incorporate TUTHILL's well known, rotary positive displacement pumping principle which has proved so effective in the solution of industrial pumping problems.

3. SPECIAL AUTOMATIC REVERSING FEATURE
If desired, these Bronze Pumps may be furnished with TUTHILL's special *automatic reversing feature*...which permits the pumps to maintain constant direction of flow, delivering from the same port regardless of direction of rotation of the driving shaft.

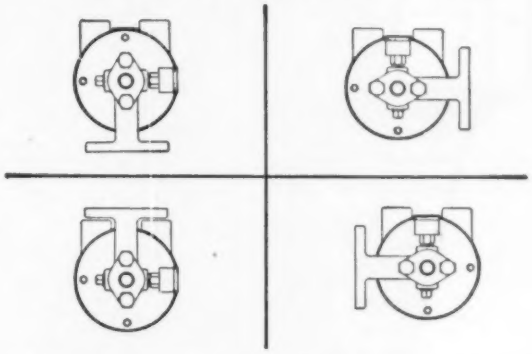
4. BACKED BY EXPERIENCE
For 30 years, TUTHILL pumps have been recognized for outstanding DEPENDABILITY, EASY MAINTENANCE AND LONG SERVICE.

5. ONE YEAR WARRANTY
TUTHILL Pumps carry a specific one-year warranty against defective material and workmanship.

6. FITTING THE PUMP TO THE NEED
TUTHILL policy is based upon "*fitting the pump to the need*" ...rather than "fitting the need to the pump".

7. CUSTOM ENGINEERED DESIGNS
The answer to your pump problem is very probably included in TUTHILL's extensive range of standard designs. However, if your requirements are of such an unusual nature that a standard model is not applicable, TUTHILL's engineers will work with you in developing a new design custom-tailored to your requirements.

TYPICAL ALTERNATE MOUNTING STYLES



New Catalog and Pump Guide Available

A new informative TUTHILL Bronze Pump Catalog is now available. It includes:

1. An "Operating Characteristics" Guide for *all* TUTHILL Bronze pumps.
2. Descriptions of typical model types.
3. Performance curves and other information.

For your copy, fill out the attached coupon—or write

TUTHILL PUMP COMPANY
945 E. 95th Street, Chicago 19, Ill.

Gentlemen:

☐ Please send your new catalog and pump guide on the Tuthill Bronze Pump line.

☐ Have your representative call.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

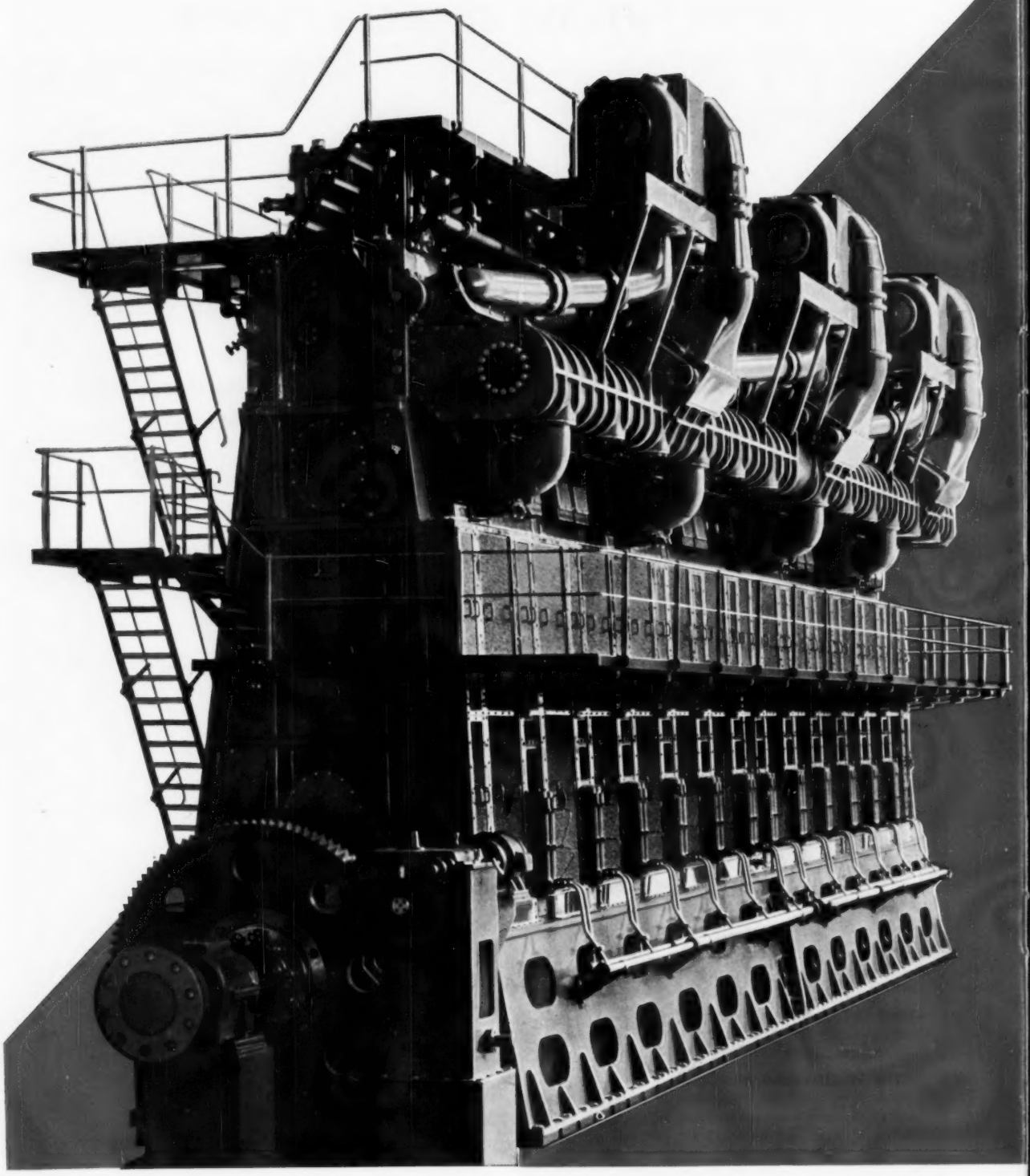
Tuthill Manufactures a Complete Line of Positive Displacement Rotary Pumps in Capacities from 1 to 200 GPM, for Pressures to 600 PSI, Speeds to 3600 RPM.

TUTHILL PUMP COMPANY

945 East 95th Street, Chicago 19, Illinois

Canadian Affiliate:
Ingersoll Machine & Tool Company, Ltd., Ingersoll, Ontario, Canada

PUMPS FOR YOUR PURPOSE



SUPERCHARGED DIESEL ENGINES

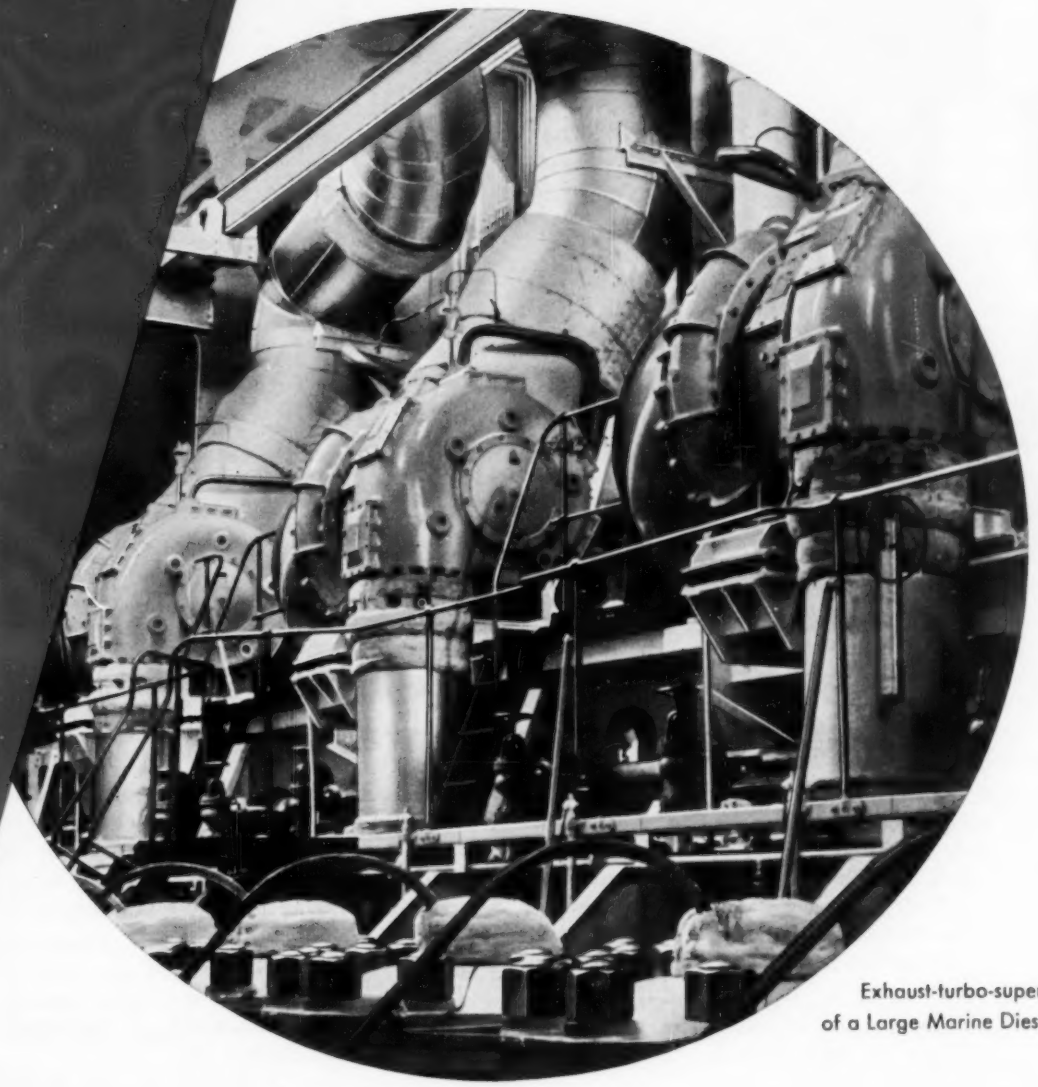
FOUR-STROKE UP TO 4,000 B.H.P.

SUPERCHARGING · HIGH SUPERCHARGING · HEAVY FUEL OIL OPERATION

TWO-STROKE UP TO 15,000 B.H.P.

SUPERCHARGING · HEAVY FUEL OIL OPERATION

M·A·N

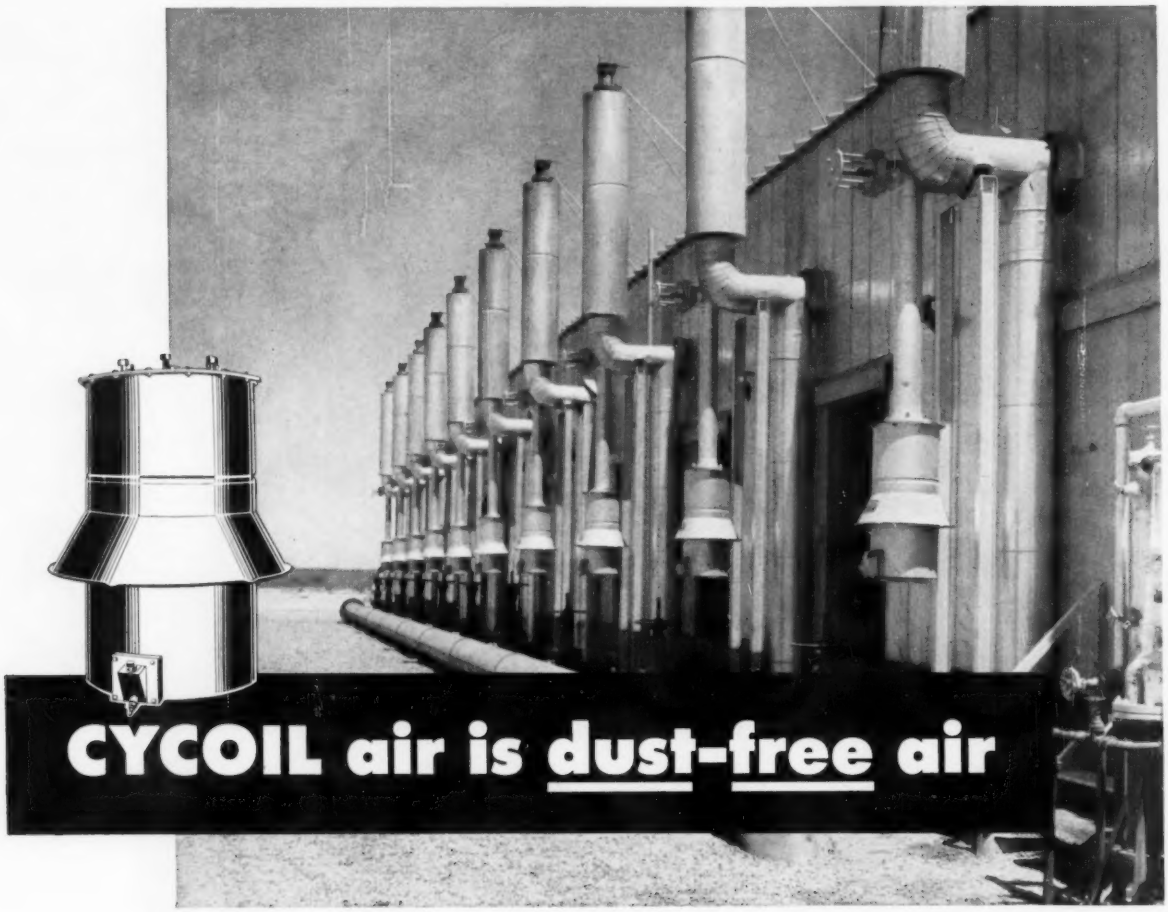


Exhaust-turbo-superchargers
of a Large Marine Diesel Engine

M·A·N
DIESEL

MASCHINENFABRIK AUGSBURG-NÜRNBERG AG · AUGSBURG
Represented in all countries

Ten AAF Cycoils deliver *clean* air to the 660 hp. engines driving pumps at the Ward-Estes Water Flood Project.



AAF Cycoils protect engines—require minimum maintenance

When engines are driving pumps for high-volume water injection used in secondary recovery, down-time means decreased production. That's why only the best protection against dust and dirt is good enough. At the Ward-Estes Water Flood Project, Ward County, Texas, ten AAF Cycoils do the job.

AAF Cycoil oil bath air cleaners require an absolute minimum of maintenance. It is not necessary to tear them down for cleaning. Due to self-cleaning action of the filter pads, the only maintenance needed is the periodic replacement of oil. Records show that Cycoils have been on the job in some applications for as long as 20-years without being dismantled for maintenance.

Cycoils offer many advantages—uniform air delivery, constant efficiency, low operation resistance, minimum maintenance. Get all the facts on AAF Cycoil oil bath air cleaner right away. Write today for Bulletin 130.

AAF herman nelson

American Air Filter
COMPANY, INC.

445 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

Type CMS Multi-Duty Filters

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BETTER AIR IS OUR BUSINESS

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Cycoil Oil Bath Air Filters

editorially speaking

Power for Protection

Should bombs drop, it won't be on corn fields. It's going to be on heavily-populated industrial areas. Two basic problems will exist—individual survival and industrial survival to sustain a counter-offensive. Any analysis of how our economy is geared shows that both individual and industrial survival depends on power. Evidence is seen in the thousands of separate emergency diesel installations—enough power to hold a refrigerated food warehouse, to take over water pumping, to keep vital communication systems alive, etc. Civil Defense authorities know the need for extensive standby prime-mover power. They also know the fantastic cost entailed in setting up emergency power on a nation-wide basis, even for only the most vital services. Yet the seeds of a possible solution to this dilemma lie in known facts. Let's look.

Fact No. 1—During World War II, several complete power barges were moved into devastated port areas to supply power. Manila is one example.

Fact No. 2—This power was tied in to existing distribution systems, partially intact and quickly patched.

Fact No. 3—Our utilities have such distribution systems, the logical way to get emergency power to a maximum number of key points.

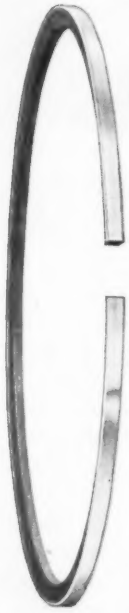
Fact No. 4—Today's high-capacity rail and trailer-mounted "power packages" add the dimension of land mobility to the power barge concept.

Fact No. 5—Some utilities are finding distinct advantages in use of such units in day-to-day operation.

Fact No. 6—Our industry has the knowhow and capacity to build a great many of such units—right now. Now let's do some "supposing". Suppose that C-D, the utilities and our industry sat down to work out Operation "Power for Protection". Utilities agree to purchase some of these units to improve their correct operations. They're valuable for peak-skimming, backing up single high-line power supplies, end-of-the-line voltage pickup, plus emergency and maintenance work. C-D authorities work out a participating plan of some sort as added inducement for the utilities to purchase, maintain and use these units. In return, C-D has first call on them in emergency. Now suppose the worst happens. Power units from unaffected areas could converge on the nearest trouble spot and sizable chunks of power would be available for vital functions immediately. This "mobile power pool" idea has advantages for all. Huge sums of money are not tied up in emergency plants to be used if and when. Utilities making the investment benefit by daily use of the versatile equipment. The diesel industry would be using its production capacity now and in an orderly fashion—not like in the historic crash programs for diesel when something happens.

B P E

This is the world's largest plant devoted exclusively to the manufacture of sleeves



Chrome plus Cyclan in Sealed Power diesel piston rings means you positively control excessive heat, breakage, side wear, friction and corrosion. They break in fast—last and last and last.

What's in it for the diesel user?

JUST THIS...

Sealed Power has more know-how and facilities to put into developing and manufacturing sleeves and sleeve assemblies, more experience to draw on.

And it shows in the product. All diesel sleeve and sleeve assemblies are designed and manufactured with extreme care. They are matched for top performance and subject to rigid quality control.

Sealed Power experience is invaluable for diesel operators—and it's available. Just write or phone. Sealed Power engineers will be glad to discuss your particular application or problem.

SEALED POWER CORPORATION • MUSKEGON, MICHIGAN • ST. JOHNS, MICHIGAN • ROCHESTER, INDIANA • STRATFORD, ONTARIO

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Sealed Power Piston Rings

PISTONS • CYLINDER SLEEVES

Leading Manufacturer of Automotive and Industrial Piston Rings Since 1911

Largest Producers of Sealing Rings for Automatic Transmissions and Power Steering Units

highlights

Still under wraps is work Ford is doing on an automotive gas-turbine engine. In a normal front engine position, the prototype operates on the regenerative cycle embodying an all-radial-flow gas generator and a single axial power turbine.

Baldwin-Lima-Hamilton is optimistic about business expected from the Federal Highway Program and new developments in several fields. These developments are the free-piston engine, broader application of the Mec-Hydro type locomotive and results of a study the company is making on developing a mobile atomic power plant.

Rotol, Ltd., Gloucester, are now making turbochargers of AirResearch type. Licensed by Garrett Corp., this Scottish firm will produce a wide range of units and the agreement provides for technical data exchange.

Canadian railways now haul trailers of licensed "for hire" motor carriers on flat cars between Montreal and Toronto. Before this, both Canadian Pacific and Canadian National Railways have been hauling railway-owned trailers in piggyback service between these cities.

Reo, now a division of White Motors, is getting set for its share of the truck market. Its hard-hitting sales campaign will include emphasis on seven newly-introduced on- and off-highway trucks and six tractors—all powered by Cummins diesels.

British-built International TD18 tractors are powered with Rolls-Royce 6-cyl diesels. These engines produce 124 bhp at 1460 rpm. Before this, similar IH models were exported to Great Britain.

Looking ahead in tractor development, M. Bennett of International Harvester foresees the following: crawlers will have final drives with infinitely variable steering ratios; basic revisions in suspension systems for smoother operation and faster speeds. Wheel tractors will have greater tractive effort under adverse conditions thanks to all-wheel drives; steering changes will improve effectiveness and operating ease. Tomorrow's operators will ride air conditioned cabs having control tower visibility with power control systems doing most of the work.

Market potential for diesel-powered industrial trucks is widening. American industry and commerce are spending some $3 billion a year for conveyor systems, industrial trucks, lifters and other materials handling equipment.

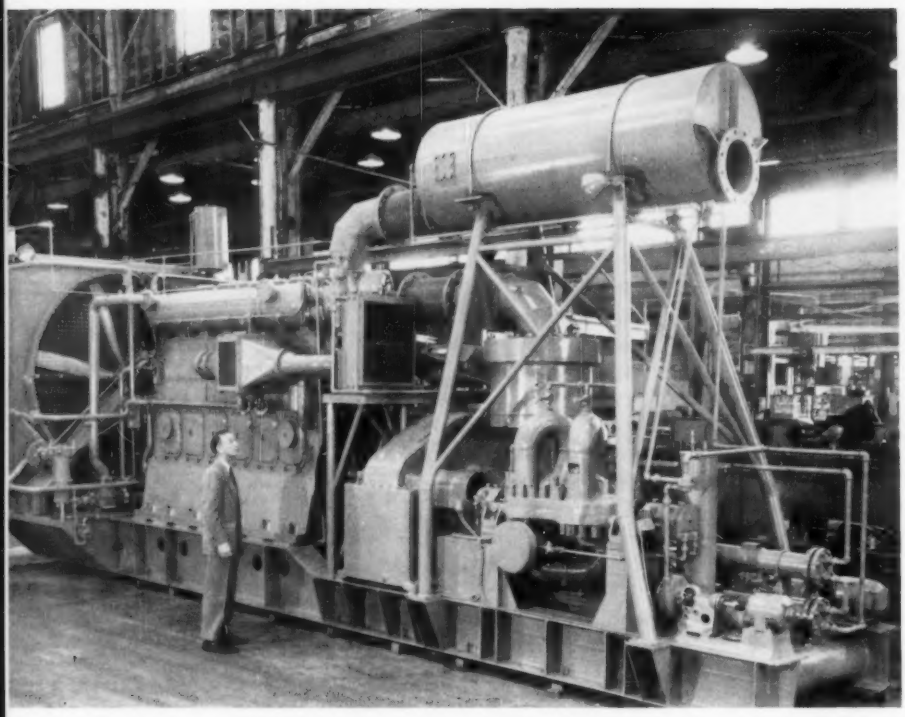
Three million man-hours without a single day lost is the safety record piled up during the past seven years by 230 workers in Socony Mobil's Brooklyn Technical Service Laboratory. In recognition, the lab received the National Safety Council Highest Honor Award. Accidents are bad business.

And while talking safety . . . McLean Trucking Co. drivers drove 108 million miles without a chargeable accident. That's 4324 miles around the world—safely. Topping the list of McLean's good drivers are Bennie Pittman and Horace James. Each has a 17-year accident-free history.

And one more safety note . . . Union Pacific Railroad earned the Award of Honor by National Safety Council. During the past year they reduced their own accident frequency rate by 47% and bettered their severity par by 80%.

ASTM has proposed an Industrial Viscosity Classification (IVC) system intended to simplify current SAE, AGMA and ASRE ratings. Suggested identification temperature—100°F. Range—2 to 2000 centistokes. Simple numbering system would identify each oil's viscosity spread. One plan proposes 25% spread for each grade (max 25% more than min). Second would use 45% spread. In first case, increasing three grades doubles viscosity; in second, increasing two grades doubles viscosity. IVC bears no relation to oil quality. ASME, ASLE, API and others are considering proposal.

Railroads should step up buying of equipment during the next ten years two or three times what they bought in the past decade. Problem—where to get the money. James M. Symes, Pennsylvania RR president, proposed a solution to Congress. Plan calls for creation of a new federal agency with initial capital of $500 million. It would purchase and then lease locomotives and cars to individual railroads at rentals sufficient to make the agency self-supporting. Railroad capital could then be used for other much needed equipment.



Wrapped and crated engine section being loaded for shipment to Middle East. Design called for easy assembly of unit on site.

Enterprise engineered and built a base on which to assemble a complete self-sustained pumping unit. Crude oil is fuel burned.

Packaged Units Pump Middle East Oil

Fully-engineered, self-sufficient and integrated pipeline pumping units eliminate major field problems of installation, alignment, piping, etc. This is of particular importance in remote areas. And these units solve the fuel logistics problem by burning the crude oil that they pump.

FOUR of the largest packaged, portable diesel-powered pumping units ever shipped from the U. S. have left San Francisco. They're going to the tiny sheikdom of Kuwait in the Neutral Zone of the Middle East.

Each of the portable 1000-hp, 600-rpm diesel power plants was made by the Enterprise Engine & Machinery Co. They'll be used by the American Independent Oil Co. (Aminoil) to pump oil from the rich new Wafra Field wells to the Persian Gulf coast.

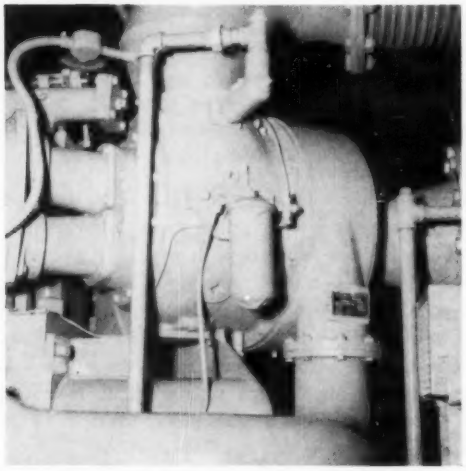
The units were hauled from Enterprise's San Francisco plant to the docks and loaded aboard ships of the Java-Pacific Lines with a Smith-Rice 100 ton crane.

The Neutral Zone to which the diesel power plants were shipped consists of a 2500-sq mi coastal strip which lies on the Persian Gulf, between its sponsors, Kuwait and Saudi Arabia. Production from the Wafra Field oil reserves is equally shared by Aminoil, which purchased the units, and the Getty Oil Co. In 1956, Wafra's oil was produced at the rate of 39,000 barrels a day and with an estimated 650,000,000 barrels in reserve, production is expected to increase sharply the rest of the year.

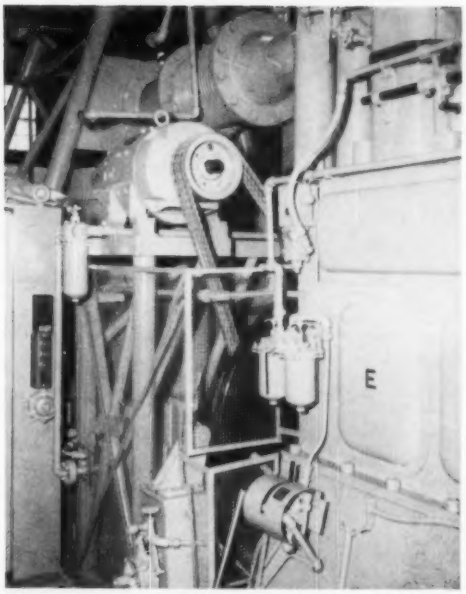
Oil is pumped from the wells, overland, 35 miles through a pipeline called the "Wafra Shipping System", to a terminal, Mina Abdulla, located on the coast. The pumping units will be located along this pipeline system. The marine terminal at Mina Abdulla is actually the shore-anchor for a 12,000-ft submarine line which connects the pipeline system with the sea berth. Tankers tie up and load the oil directly from this terminal.

Pumping oil from the hot, desolate field outpost to these waiting tankers puts a constant series of everchanging demands upon the power source. Factors which are considered part of normal operating procedures range from burning 130°F temperatures, with fierce and sudden sand storms, to bleak, inaccessible locations and changing production loads. In addition there are the usual demands for economy, dependability, durability, ease of maintenance and availability of parts and service.

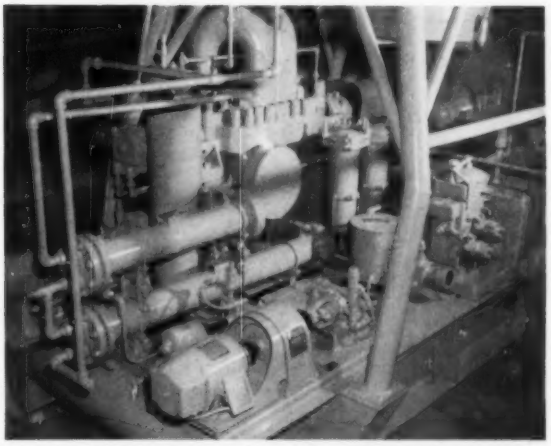
Pipeline terminal at Mina Abdulla shows why.



Elliott turbocharger will handle up to 130°F air.



From bottom are: Crude oil control valves; crude oil strainers; and automatic shutdown device. Left of generator are lube oil strainer and alarm system mounted on edge of the control panel.



Alongside main pump, equipment for crude oil fuel preparation includes centrifuge (right), filters, heaters, pumps.

To meet specifications of the consulting engineers, Carroll E. Bradberry and Associates, Enterprise designed lube oil, fuel oil, air intake intercooling, jacket water cooling, and crude fuel-heating systems to fit into compact and portable units. The result was four highly-flexible pumping units capable of maximum adaption in a minimum of time. Each of these power plants meets all of the operating conditions. They were specially designed as individual packages, easily and economically transportable from one site to another.

The engines, two of them model DSG-36 and two dual-fuel model DGSG-36, have an economical fuel arrangement which will permit them to burn the crude oil they are pumping and the natural gas from the wells. Enterprise engineers point out that fuel savings as high as 90% have been obtained from similar operations in the past.

Other features of the engines include Enterprise Intercooling, which will permit normal operation under extremely high temperatures; specially designed heads for converting the heavy fuel engines to dual-fuel operations easily and quickly; removable radiator and its sub-base; and color-coding system of all piping joints to help ease problems of site assembly.

Principal Accessory Equipment

Main Centrifugal Pump	United Centrifugal Pump
Speed Increaser	Western Gear Corp.
Radiators & Intercooler	Young Radiator Company
Fuel Oil System	
Crude Oil Centrifuge	DeLaval Separator Co.
Polishing Filters	Wm. W. Nugent & Co.
Heat Exchangers (heaters)	E. C. Cooley Co.
Circulating Pump	Viking Pump Company
High-Pressure Pump	Geo. D. Roper Corp.
Strainers	Purolator Products, Inc.
Final Filter	Winslow Engineering & Mfg. Co.
Lube Oil Filters	Wm. W. Nugent & Co.
Air Cleaner	The Air Maze Corp.
Heat Recovery Silencer	Maxim Silencer Company
Controls & Instruments	
Pyrometers	Illinois Testing Laboratories, Inc.
Thermostatic Regulating Valves	Amot Controls Corp.
Automatic Shutdown	Amot Controls Corp.
Liquid Level Controllers	The Mercoid Corp.
Alarm System	Enterprise Engine & Machinery Co.
Air Compressor	Quincy Compressor Co.
Auxiliary Generator	General Electric Co.

RECOGNIZE THE "WHY" OF GEAR FAILURES

YOUR gears have a story to tell. Just look at them and you'll know what it is. If they're in good condition they'll show it. If they have failed — they can show why.

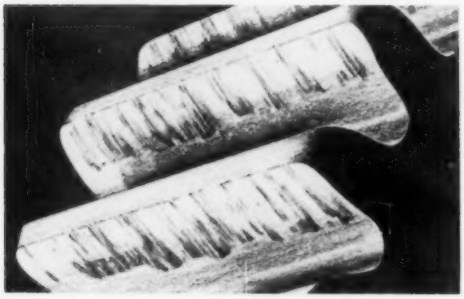


Fig. 1

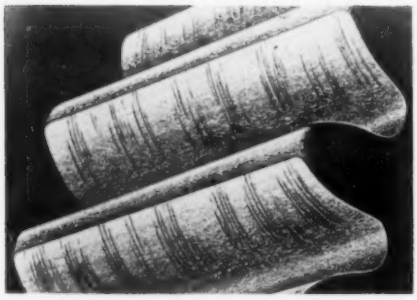


Fig. 2

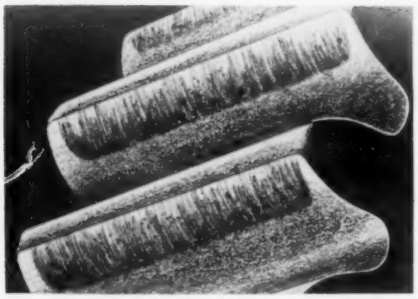


Fig. 3

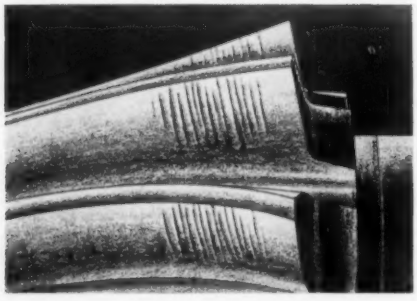


Fig. 4

Modern gears are doing heavier work than ever before. Often this is done deliberately to speed up production. Today gear manufacturers are making precision gears by redesigning, and using better steels. These give better performance. Lubricant manufacturers are producing tougher lubricants to meet industry's demands. Yet there are limits to how much you can overload or otherwise mistreat even the best gears using the best lubricants. Overloads or shock loads, high speeds, misalignment, wrong or dirty lubricant, etc., all shorten gear life and eventually cause failure.

Types of Gear Failures

The following photos furnished by The Texas Co. and text based on data from their publication "Lubrication" show what can happen to gears and why.

One type of failure results from *wear* and there are several types of gear wear other than normal. The *abrasive wear* seen in Fig. 1, is surface injury caused by fine particles in lube oil or embedded in the tooth surface. These may be metal from gear teeth or bearings, abrasives not removed before assembly, sand or scale from castings, or other impurities in oil or air.

Scratching is another form of gear wear. It is clearly shown in Fig. 2. It can be identified by deep scratches in the direction of surface sliding. These are caused by particles that are larger in size than those associated with abrasive wear on the gears. The source of these particles must be found and eliminated. Analysis of the particle composition will help in determining where they're coming from.

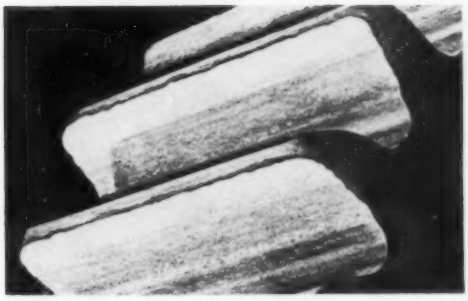
Overload wear is also a form of gear wear. This happens under conditions of heavy load and low speed in both hardened and unhardened gears. Metal seems to be removed progressively in thin layers or flakes leaving surfaces that appear somewhat as if etched. See Fig. 3. Heavily loaded gears require higher viscosity, more adhesive type lubricants. These provide a cushioning effect to offset the effect of tooth impact.

Ridging is a particular form of scratching. An example is seen in Fig. 4. Closely spaced grooves and ridges can be seen clearly in the direction of surface sliding. This may occur on case-hardened surfaces of hypoid pinions under heavy load.

Don't just replace gears — find the cause of failure. The Texas Company's engineers have worked out a visual interpretation of what failed gears can tell you.

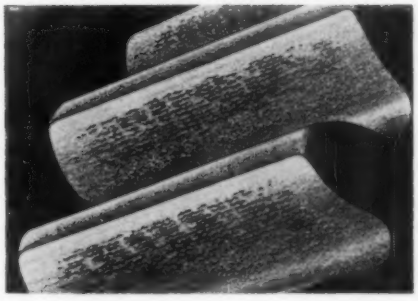
Plastic yielding is the cause of another type of gear failure. Tooth surfaces are deformed due to heavy loads. It can be identified by fins on the tip edges or ends of the teeth and an occasional ridge and matching groove on the mate at the pitch lines. Fig. 5, shows *rolling*, a form of plastic yielding resulting from heavy, even loads and sliding. *Peening* is another form of plastic yielding. This is caused by localized impacts or by uneven heavy or shock loads.

Fig. 5



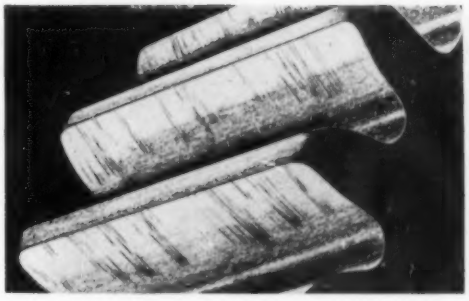
Rippling, also a form of plastic yielding, occurs over areas of case-hardened steel surfaces under heavy sliding loads. It can be easily identified by a fish-scale pattern as seen in Fig. 6. In each form of plastic yielding the load should be reduced. But if this is not possible, gear life may be lengthened by using the proper lubricant as recommended by either the equipment or lubricant manufacturer.

Fig. 6



Welding results in a third type of gear failure. It is a surface deterioration occuring when pressure, sliding and temperature rise combine, forcing out lube oil film. Metallic surfaces then rub together, overheat and cause welding of tiny particles of metal. As gears move apart, these metal particles are torn apart. This can be avoided or arrested frequently by an extreme pressure lubricant.

Fig. 7



Slight scoring is a minor surface impairment, also of a welding nature. Fig. 7, shows slight tears and scratches in the direction of sliding. Note how they start at or near the tip of the tooth, the area of high surface stress and sliding velocity.

Severe scoring is a more advanced degree of welding. Fig. 8, shows the deep scratches and adhesions on the surfaces of the gear teeth. These lead to rapid deterioration of the metal and failure. Here again an extreme pressure lubricant should be used to reduce the welding.

Fig. 8

Surface fatigue is a fourth type of gear teeth failure. It is the forming of cavities in the surfaces of the teeth. Usually these are quite small at first and at separated areas of high compressive stress often due to surface irregularities. *Initial pitting*, seen in Fig. 9, is a mild form of surface fatigue. It may ocur when gears are first put in service and continue until local high spots have been worn so that there is sufficient contact area to carry the load without further trouble. This pitting can be corrected and is nonprogressive, it is not necessarily serious.

Fig. 9

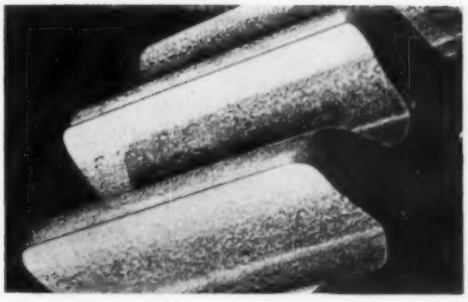


Fig. 10

Destructive pitting, shown in Fig. 10, is the type of surface fatigue that continues to progress after the initial period of operation. Frequently it increases in rate to the point that the remaining unpitted areas are too small to carry the load. High pressure areas result. These may cause rapid destruction of the metal if operation under this condition continues.

Fig. 11

Spalling is even a more extensive type of surface fatigue. Fig. 11, shows how in this case a considerable amount of surface is undermined and eventually breaks off in small or large flakes. This seems to occur only in case-hardened gears. It may begin at a surface crack in a way similar to pitting but does not necessarily follow the junction between the case and core.

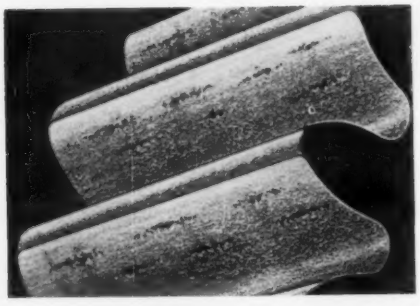


Fig. 12

The following types of gear failures fall into miscellaneous forms of surface deterioration. For example, the *corrosive wear* seen in Fig. 12, is the result of chemical action on the metal teeth surfaces. This was caused by improper kinds of lubricants, acid or alkaline contamination, or oxidation. The effects of each of these may be accelerated by too much moisture in the gear case.

Fig. 13

Burning is a discoloration and loss of hardness of the gear teeth. This can be seen in Fig. 13. It results from high temperature produced by the excessive friction caused by overload, overspeed, lack of backlash, or faulty lubrication. A repeat failure by burning can be easily avoided by eliminating the cause.

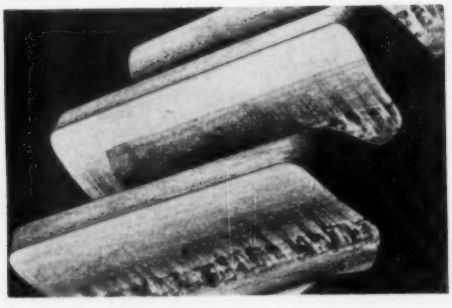
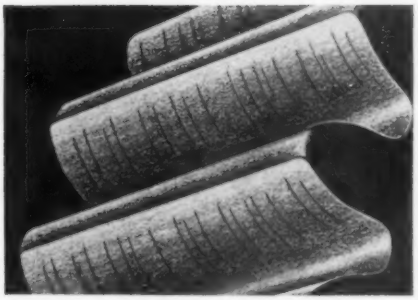


Fig. 14

Interference is a type of failure due to extremely heavy tooth contact on a limited area. Fig. 14, shows what it looks like. It results from improper tooth action such as excessive heavy contact between the tip edge of one tooth and the fillet surface of a mating tooth. This may cause localized abrasion or gouging. Such a condition may be the result of improper design or manufacture, assembly of gears at too close a center distance for the existing profile shapes on the teeth, or deflection.

Grinding checks are fine cracks on the tooth surface. Generally these are in a definite pattern as seen in Fig. 15. They are caused by improper grinding technique, improper heat treatment, or both. They are usually not visible until the gears are placed in service and are used for a short time.

Fig. 15

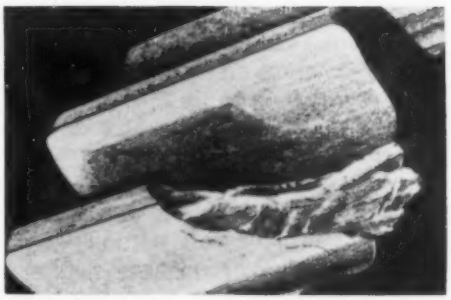


The remaining types of gear failures to be discussed fall under the heading of tooth breakage. *Overload breakage* for example, seen in Fig. 16, is the direct result of an unexpected shock overload such as may be caused by jamming of other connected machinery. This type of failure would not be due to improper design, application, or faulty manufacture of the gears.

Fig. 16

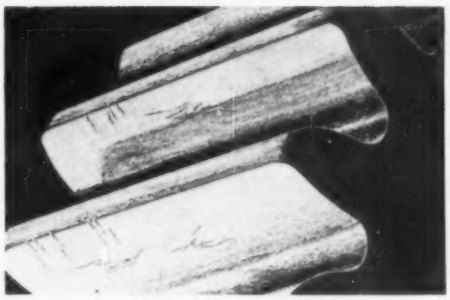
Fatigue breakage, Fig. 17, is of a progressive nature. It starts as a short crack and continues to extend until a portion, or a whole tooth breaks off. The discoloration and rubbing seen on the fractured surfaces are indications of fatigue breakage. Sometimes fatigue fractures have a series of "contour" lines roughly concentric and spreading from a focal point. This area has a smoother appearance than the surface of the final fracture. This type of breakage results from numerous repetitions of a normal load rather than a single shock load.

Fig. 17



Cracking, which is seen in Fig. 18, results from residual stresses induced in hardenable material by faulty manufacturing control, or improper operating conditions. One cause is too soft a core, or some other form of improper heat treatment. *Chipping* and *flaking* are other forms or degrees of cracking failures in which portions of teeth break off.

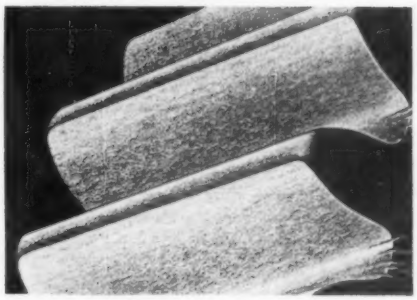
Fig. 18



Quenching cracks generally result from improper heat treatment. Extremely sharp fillets or tool marks will also cause them to ocur. As shown in Fig. 19, they generally start at the roots or ends of the teeth. Deliberate fracturing of such a tooth will show a dark area where the crack existed.

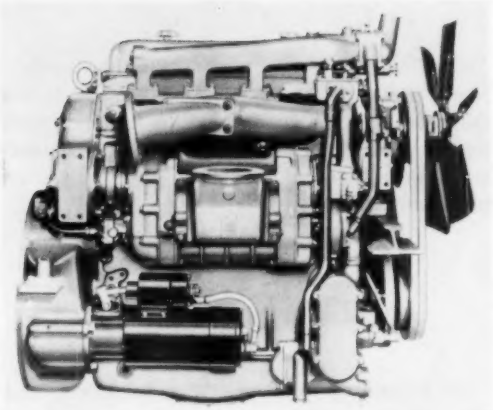
Occasionally gear failures occur which are not discussed here, but these are of a very rare nature. Those most commonly encountered are shown above.

Fig. 19



Detroit Diesel's 71E and 71T Engines For Trucks and Buses

New Series 71 engines, tailored specifically for heavy-duty vehicular service, are offered to all truck and bus manufacturers for original equipment use.



Lowest horsepower unit of new Series is the 4-71E model. It's tailored for good economy with improved performance.

THERE'S a new line of "Jimmie" diesels. Since Detroit Diesel has stuck to their policy of making all engineering improvements around the familiar basic design, you have to look beneath the surface to see all that's been done. The new series includes the 71-E and 71-T models.

Four and six-cylinder models, both blower pressure-scavenged and series turbocharged (blower and turbocharger), were developed specifically for the fast-growing transportation industry. They are available to all truck and coach manufacturers for use as original equipment.

The charts tell the performance story so let's look at some internal details to see what's been done. One major achievement is freer breathing. Detroit Diesel has made steady improvement in this direction since the days of the war-time 64-hole liner porting.

Better Breathing

Getting a maximum amount of air into the cylinder with a minimum of pumping power taken from the engine is a basic objective of 2-cycle engine design. When air gets to the cylinder, you must utilize it effectively and then get rid of combustion gases with a minimum of flow restriction.

New blowers of higher-capacity design and turning at lower speeds are used in the new engine series. All the air is supplied by the blower in the 71-E models. The 71-T models feature 2-stage or series supercharging.

The first pressure boost occurs in the turbocharger's compressor. This pressurized air enters the intake of a mechanical blower where it undergoes a second compression stage. Although the quantity and pressure of air supplied is greater than with the standard blower, the parasitic drain on engine power is substantially less. This accounts for a good part of the increased net engine power in the 71-T models.

Cylinder liner inlet area has been increased 38% as compared with earlier designs. Modifications in the block's port belt area and the liner's figure "8" ports provide freer entry of air. More air is packed in and faster. Beside aiding combustion, this also results in cooler piston operation.

Piston crowns have been modified to take full advantage of the increased air. Also, a newly-designed top compression ring is used to add to piston life and engine power. Fuel injectors have a new spray tip designed to give more complete atomization and to reduce fuel consumption.

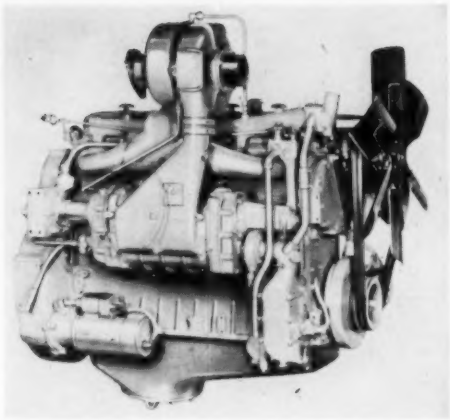
Four-valve cylinder heads are used on the 71-E's as well as on the 71-T models. These heads were used on the 71-T engine when it was first introduced a little over a year ago (*"Detroit Diesel Introduces Turbopower", Diesel Power, June* 1956). They were also used on some marine engines, so their effectiveness in improving scavenging is well established.

Ratings

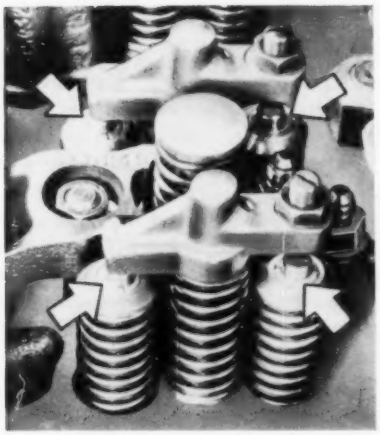
Of course, these are not the only changes—only the major ones. A great many individual parts and assemblies have been improved functionally as well as in length of service life. All are incorporated in this new engine series. As a result, Detroit Diesel feels that these engines will not only improve highway performance and fuel economy, but will provide longer operation between overhauls.

Basic rating for the 4-cyl 71-E is 140 hp at 2100 rpm; for the 6-cyl engine, 210 hp at 2100 rpm. The engines are rated at 1500-ft elevation at 90°F. A purposely conservative rating method was used to allow truck manufacturers to choose transmission, differentials and tire sizes for required on-the-road performance without de-rating.

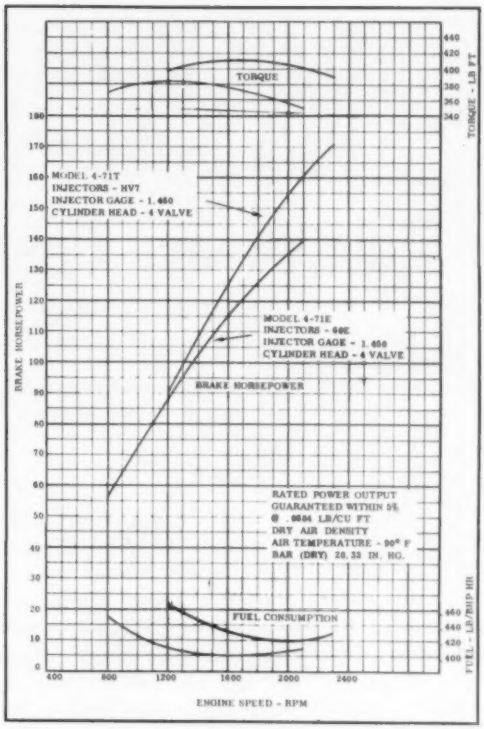
Basic rated horsepowers on the 71-T engines are: 4-cyl unit—171 hp at 2300 rpm and for the 6-cyl unit—236 hp at 2100 rpm.



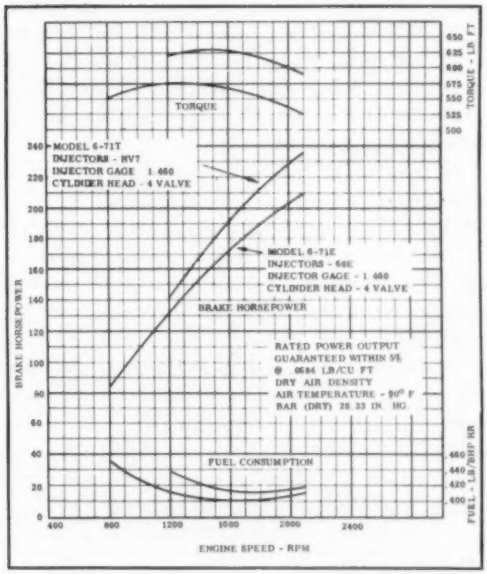
Highest horsepower unit is the 6-71T with good torque up in the average operating range. Specific weight is low.



Four valves per cylinder, actuated in pairs by bridges, give faster, more complete scavenging. Injector body was reshaped to clear valve gear.



Performance curves for the 4-71E and 4-71T engines. Lower of the two torque and fuel consumption curves (starting at 800 rpm) are for the 4-71E engine. For maximum fuel economy, it has special 60-mm injectors.



Similar comparison of the 6-71E and 6-71T engines. As above, lower torque and fuel consumption curves (starting at 800 rpm) are for the "E" model engine. Conservative ratings plus a range of torque and horsepower characteristics offers maximum installational flexibility with these and the 4-cyl models.

Specification	4-71E	6-71E	4-71T	6-71T
Rated Horsepower	140	210	171	236
Max. Torque, Lb Ft @ RPM	385 @ 1200	577 @ 1200	411 @ 1600	630 @ 1400-1600
Fuel Consumption Full Load, lb/bhp/hr	0.410	0.410	0.431	0.418
Min., Full Load @ Hp & RPM, lb/bhp/hr	0.400 @ 115-1600	0.400 @ 173-1600	0.418 @ 155-2000	0.410 @ 212-1800
Injector Type	60E	60E	HV7	HV7
Blower Drive Ratio	1.69:1	1.69:1	1.55:1	1.55:1
Turbocharger Used	***	***	Elliott M-5	Elliott M-5
Air Delivery, CFM	500	750	690	836
Air Pressure, In. Hg (rated engine RPM)	8	8	24	25
Lb per Hp, Standard Equipment	11.07	9.57	9.77	9.03

Paper Wipers Help Reduce Maintenance Costs

by
L. V. GLASS

General Foreman, Lindenwood Yards
St. Louis-San Francisco Railway Company
St. Louis, Mo.

TO enhance safety and reduce wiping costs in diesel maintenance, disposable paper wipers have been adopted for standard use at our Lindenwood and Springfield shops. Need for safer wiping materials was recognized about two years ago when cloth wipers were frequently found to contain concealed needles, pins, and other metal pieces that cut employees' hands and faces when used for personal wiping.

In the safety program now employed at the Lindenwood shops, employees are instructed to clean their hands two or three times a day using a hand cream which helps to loosen dirt and grime, as well as preventing skin irritations and infections. Paper wipers, developed by Scott Paper Company, are used to remove the dirt and cleanser.

Another reason that paper wipers were adopted is that costs for cloth wipers became exorbitant. In addition, cloths were being used beyond their saturation points. More dirt was "wiped on" repaired parts than "wiped off" in many instances, thus curbing efficiency.

In shop work, dirt is recognized as a major factor in mechanical failures of both diesel and electrical parts. Wipers are effective in preventing entry of dirt when used to clean external areas before the equipment is opened up. Being essentially lint-free, these paper wipers are very effective for internal cleaning. They are clean to start with and leave no fuzzy residue to cause improper functioning.

Illustrating a typical use, paper wipers facilitate cleaning dust, dirt and corrosion from oil throwers and bearing caps of traction motor bearings. These parts are cleaned every time locomotive wheels are changed for regreasing. Paper wipers are saturated with solvent and used to wipe grease from the axles prior to regreasing. Vigorous rubbing over the axle surfaces effectively removes and loosens oil grease films.

They are similarly effective in cleaning all diesel parts and electrical components. In addition to shop use, we are finding many other uses aboard diesel locomotives.

Scott Wipers are placed aboard every diesel locomotive for use by engineers to clean controls, brake and throttle handles, as well as the glass face of the speed recorder. This dial must always be legible to assist the engineer in adhering to speed regulations. The paper wipers are suitable also for personal wiping convenience.

Firemen use the wipers in the diesel's engine room when checking and servicing equipment, and for wiping their hands and faces.

Considerable tonnage of paper wipers is consumed annually at the Frisco's Lindenwood Yards, and the main diesel shops in Springfield, Mo. The Lindenwood shops maintain 38 assigned diesels, and service about 1400 a month that come in from other points. In Springfield, 175 diesels are maintained, and about 4500 serviced monthly. This will give you some idea of the usage.

As to economics, cloth wipers formerly cost 18¢ a pound. About half the cloth wipers were used aboard diesel locomotives on daily runs and were never recoverable. Disposable paper wipers cost only a fraction of a cent apiece and, although employees are encouraged to use them freely, their cost is substantially below our former wiper expense.

This is not the only savings, however. For example, many employees formerly would take a few minutes during the day to obtain cloth wipers. The collective loss of time could represent more than the entire cost of the wipers themselves.

Time of service personnel also proved costly for handling cloth wipers. These employees had to separate, bundle and load the wipers in box cars for shipment to the company's laundry in Springfield. Now, most of these handling expenses have been eliminated. Paper wipers are disposed of in 10-gal. discarded paint cans at various locations in the diesel house.

Based upon performance for the past two years, paper wipers provide an added safety feature for shop personnel and meet the need for efficient, economical, wiping materials.

Northwestern Saskatchewan site of the Gunnar Mines Limited uranium ore mining operation. Fuel tank farm and power house are to the right of docks.

DIESEL POWER PROCESSES URANIUM

You may read in your daily paper about the "big bang" or the tamed power reactor. Here's the news they don't headline— quickly-installed diesel generator sets steadily supplying day-in, day-out, low-cost power for processing basic nuclear fuels.

BITTER cold, gummy glacial silt and an almost inaccessible location couldn't stop a diesel plant from insuring successful mining of uranium in the Arctic. The development of this strategically valuable uranium deposit was carried out by Gunnar Mines Limited.

The uranium ore is located in northwest Saskatchewan, less than 450 miles south of the Arctic Circle. Temperatures in this area range from 88°F above zero in June to 55°F below zero in January. The average winter temperature is minus 10°F and the freeze-up period extends from October 25th to May 15th.

Before production could begin, a diesel power plant, mining equipment, a 1250-ton per day ore treatment plant and a community to house 800 persons was required. The Gunnar property is located on the north shore of Lake Athabaska, 450 air miles northeast of Edmonton, Alberta and 250 miles from the northern end of the railroad at Waterways. Thus, for personnel, the only access to the property is by aircraft. For heavy equipment and bulky supplies, the only access is by light freight and by barge via the Athabaska River during the summer.

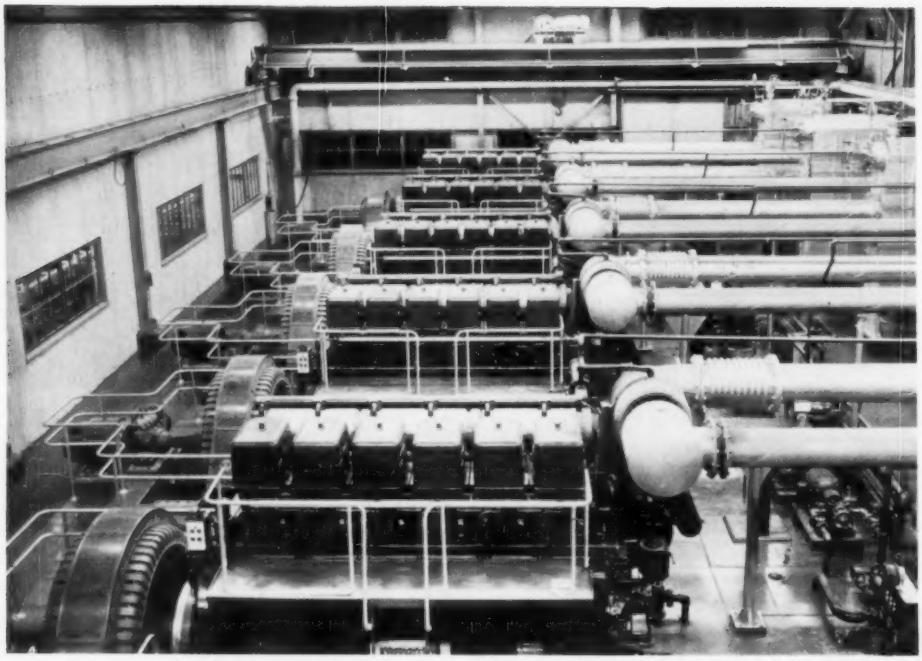
From discovery to the production of treated ore in 38 months, is a respectable achievement for any mineral development. But the unusual conditions which complicated the development of the Gunnar Uranium deposit make this schedule even more remarkable.

The ore body at Gunnar resembles a massive pipe which goes down from the surface at a 45-deg angle for a known length of 1400 ft. Its diameter near the surface is about 450 ft. This upper portion will be mined by open pit. The lower portion of the pipe is under Lake Athabaska and is protected from the lake by a 400 ft thick sill. This ore will be removed by underground-mining methods.

Development of the open pit involved removal of 353,000 cu yd of overburden and 900,000 tons of waste rock tapping. It consisted of 2 to 3 ft of muskeg, 20 to 60 ft of frozen glacial silt and huge tongues of crystal-clear ice scattered throughout the overburden. As can be imagined, this material gave considerable trouble.

More than 450 tons of earth-moving equipment and vital supplies were flown to the site from March to May 1954 and landed on an ice runway prepared in St. Mary's Channel. In June, the heavy equipment and bulkier supplies began to arrive by barge.

That summer, 20,000 tons of freight, including 96 carloads of cement, arrived by water. Four Nordberg 1200-hp diesel engines for the power plant were among the



Five Nordberg diesel generator sets with a sixth being installed will supply 5070-kw. Foster-Wheeler waste heat boilers at upper right produce low-pressure steam.

larger items of equipment. With the arrival of this type of equipment, construction of the major buildings proceeded rapidly.

Construction and operation of mine, mill and town facilities requires a considerable amount of electric power. Since the area does not lend itself to hydroelectric generation, Gunnar chose a diesel-electric type power plant. Five Nordberg 4-cycle diesel engines are now in service and a sixth is being installed. Total plant capacity will be 5070 kw.

The engines are 6-cyl, Supairthermal diesels, with 13-in. bore and 16½-in. stroke, each rated 1200 hp at 450 rpm. They are direct connected to English Electric 2300-v, 60-cycle generators rated 845 kw. During a recent one-year period the power plant generated 18,845,850 kwh and fuel consumption averaged 16.84 Imp gal per kwh.

Extremely cold temperatures naturally present special problems for Keith Crotean, Mechanical Supt. and Oli Kristjanson, Power House Supt. The year's supply of diesel fuel, 1,600,000 Imp gal, is brought in by barge each summer. The tank farm is located near the docks and is 800 ft from the powerhouse. Imperial Esso fuel oil #46, classified as a Bunker "C" or No. 5 oil, is burned. Since it has an A.P.I. gravity of 10.1 and a pour point of 0°F, each storage tank contains a heating coil with 42 sq ft of heating surface. This system is sufficient to maintain a flow of approximately 7 gpm through a 3-in. Viking gear-type pump, even in the coldest weather (minus 55°F).

Because of the solid rock in the area, oil lines and all other service pipes are not buried. They are encased in wooden, heated pipe boxes that are supported above the ground. The pipes are wrapped with a tough moisture-resistant paper and intervening spaces in the box are packed with wood shavings. This affords good protection and pipes seldom freeze.

At the power plant the temperature of the oil is raised to 180°F in two Rosenblatt, plate-type heat exchangers. It is then cleaned in either of two Sharples Nozljector Recycle centrifuges and stored in five, 1000-gal day tanks. These are lagged with 1½-in. of magnesia block insulation and the oil retains a high percentage of its heat prior to use.

Cooling water is drawn directly from Lake Athabaska to a 1000-gal storage tank in the powerhouse. A conventional, indirect-type cooling system, with a Ross heat exchanger, is used. A Zeolight water softener is used to supply make-up water for the engine jackets.

Barrels of lubricating oil are brought in each summer by barge and are stored in the warehouse yard from where distribution is made as required. Nearly 10,000 gal were consumed during 1956.

Exhaust gas from the diesels is used in two ways. First it is passed through Foster-Wheeler waste-heat boilers and produces 3000 lb of 50-psig saturated steam per hour per engine at full load. The gas then passes up the exhaust pipe which is surrounded by the scavenging air intake pipe. In this way a reasonably constant air intake temperature is maintained.

The steam produced is used in heating the many plant and camp buildings. All buildings are of modern construction and are supplied with chlorinated water, electricity and steam heat. A considerable quantity of steam is also produced in the acid plant which produces 100 tons of 100% sulphuric acid each 24 hours.

Current tonnage from the open pit is about 35,000 tons

Power plant last winter. A 20-ft extension has been added at right end to house the sixth Supairthermal engine-generator set.

of waste and 11,000 tons of ore per week. The ore is reduced in three crushing stages by Nordberg-built Symons Crushers to minus 5/8-in. size. The mill has two identical sections, each with a capacity of 850 tons daily. Crushed ore is further reduced in two grinding stages and is thickened to 57% solids prior to leaching. Sulphuric acid is introduced into the primary agitator and sodium chlorate into the secondary agitator.

The uranium is then recovered from the solution by the ion-exchange process, followed by precipitation with magnesia. After filtering, washing and drying, the yellow powdered uranium oxide is packed in steel drums for air shipment. A 5600-ft airstrip was hacked out of the brush and a company-owned plane maintains a regular schedule between Edmonton and the Gunnar airstrip.

The Gunnar uranium deposit now has an estimated value of over $130,000,000. The planned facilities were completed in little more than three years from the date of discovery at a cost of $20,000,000. Today, Gunnar Mines Ltd. is one of the largest producers of uranium in Canada.

Equipment List

Generators	English Electric Co. of Canada
Governors	Woodward Governor Company
Turbochargers	DeLaval Steam Turbine Company
Fuel transfer pumps	Haight Pump Company
Fuel filters	Winslow Engineering Company
Fuel oil heaters	Kewanee-Ross Corporation
Fuel injection pumps	Scintilla Div., Bendix Aviation Corp.
Lube purifiers	Winslow Engineering Co.
Lube oil pumps	Geo. D. Roper Corp.
Lube coolers	Kewanee-Ross Corporation
Jacket water pumps	Weinman Pump Mfg. Company
Intake air filters	American Air Filter Co., Inc.
Air compressors	Quincy Compressor Company
Air intercoolers	Young Radiator Co.
Exciter	English Electric Co. of Canada
Switchboard	English Electric Co. of Canada
Pyrometer	Illinois Testing Labs., Inc.
Alarm system	Viking Instruments Inc.
Switchgear	English Electric Co. of Canada

Guide for Timing Gear Alignment and Clearance

OUT-OF-LINE or out-of-round main bearing saddles mean trouble. They must be corrected during engine rebuilding. General practice is to set the bar to take a minimum of metal from the block side. But sometimes a deeper cut than you would like is unavoidable and you may be in trouble with timing gear meshing.

If you're doing a lot of engine rebuilding, you will be interested in some tips from the Automotive Engine Rebuilders Association on how to do this correctly.

When line-boring to true up crankshaft main bearing saddles, the timing gear backlash may change enough to cause excessive noise and wear. This applies as well if the camshaft bearings are line-bored. The following procedure from an AERA bulletin explains how to get perfect alignment and avoid these troubles.

When preparing to line-bore the main bearings or main saddles, first install the camshaft bearings. Then either line-bore them and install the camshaft or merely install the camshaft in the finished camshaft bearings. Next set up your boring bar for line-boring the mains.

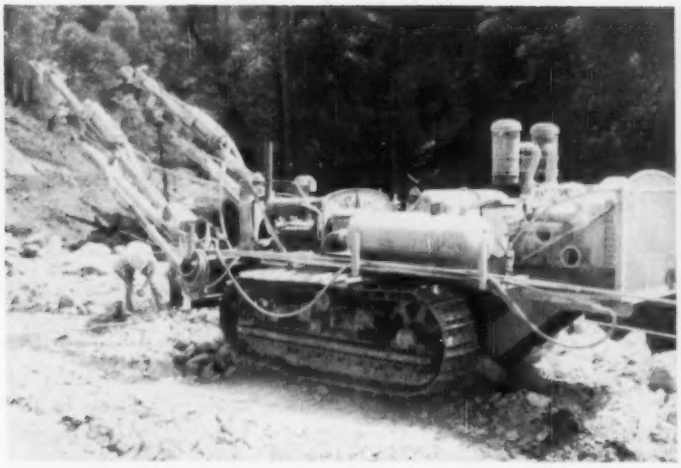
Bush a crankshaft gear down to a snug sliding fit on your boring bar. When making this bushing, bore the hole and cut the outside without removing from the lathe to get uniform thickness all around.

Slip this specially bushed crankshaft gear on your boring bar and check how it meshes with the camshaft gear before line-boring the mains.

If you are going to line-bore the camshaft bearings, reverse the procedure. Machine a straight shaft 1½-in. longer than the first three mains. Grind this shaft to the OD main bearing size. With the same setting, grind the 1½-in extension on the front end to a press fit for the crank gear. Press the crankshaft gear on this short shaft and tighten in the block with the first and third main bearing caps.

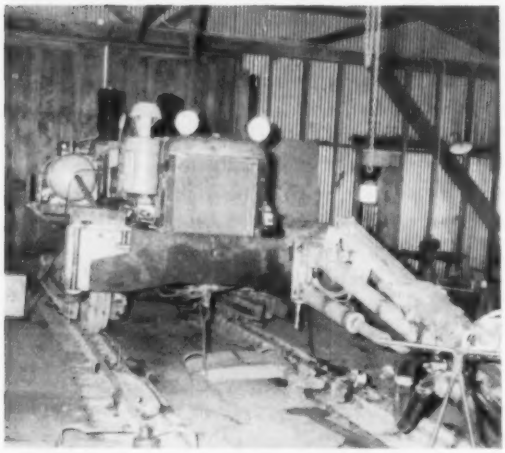
Bush a camshaft gear down to a sliding fit on your boring bar. Set up to line-bore the camshaft bearings. Then slip the bushed camshaft gear on your boring bar and see if you have the gear fit that you want.

By following this procedure, perfect alignment and correct clearances will be obtained between the timing gears. It will not be necessary to make any adjustment on the timing gears to compensate for lowering of the crankshaft or camshaft resulting from removal of metal from the bearing saddles during the line-boring procedure.

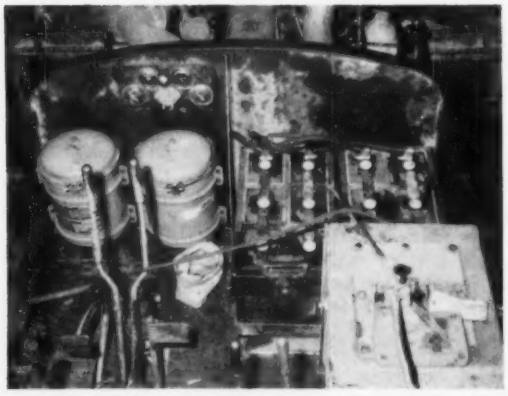


Completed unit with air compressor at rear (twin air cleaners high) and twin wagon drill booms at front.

Compressor and iron work necessary for its support at rear of tractor.



Wagon drill booms attach with brackets to front support plate. Note big cleaner for engine air.



Filters for lube oil and fuel oil flanked by batteries for engine starting and lighting.

TRACTOR CONVERTED TO WAGON DRILL

By B. S. Hirst

Rock drill built from an old tractor proves to be just the ticket for Oregon contractor's operations.

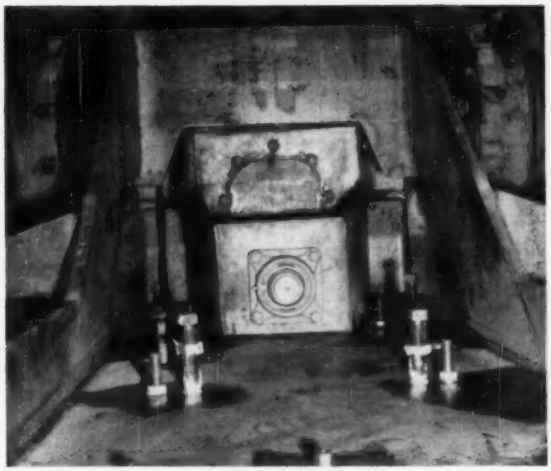
UP in Eugene, Oregon, Contractor S. W. Groesbeck needed a machine for rock drilling. So he built one. Mr. Groesbeck has specialized in building timber access roads and doing some revetment work. He's now building an access road on the coast, just south of Coos Bay, Oregon.

He had his own ideas of what he wanted in the way of a rock drill. It was to be mounted on a tractor. Not wanting to tie up a new-model tractor, he bought an old Allis-Chalmers HD-14 and rebuilt it. The finished product bears little resemblance to the original.

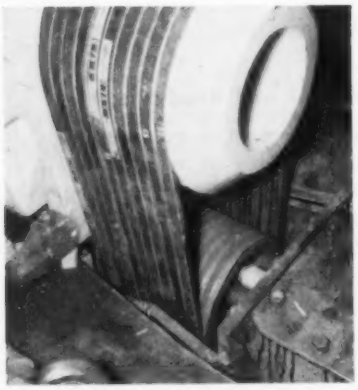
Several changes were made in the basic tractor. Leaves were added to the main springs to handle the extra weight to be carried. In the transmission, all but the lower gears were blocked off. However, the gears were left on the shafts to aid in oil circulation.

The Series 6-71 Detroit Diesel engine was completely overhauled and 80-mm injectors used to get a needed power increase. The fuel tank was made larger, extending over the original seat location.

In anticipation of a lot of rock dust, a large oil-bath air cleaner was set off to the side of the radiator. Also, large filters were added for cleaning engine lube oil and the



End bearing for support of transmission's top shaft and base mounting for compressor.



Vee-belt drive from transmission's top shaft to the compressor shaft.

fuel. It was felt that this would substantially improve engine life under the adverse dust conditions.

A Joy air compressor was mounted on the rear. It was set up for belt-drive from the top transmission shaft with about a 1.3 to 1 reduction. With the engine turning 1800 rpm, the compressor is turning its recommended maximum speed of 1380 rpm. It's a big unit having 630-640-cfm capacity. This permits the use of two wagon drills at one time.

Air storage tanks were mounted on each side, over the tracks. Brackets were extended to carry air hose and drill steel.

Two drill booms were mounted on a large plate attached to the front of the tractor. A tool box was located between the boom brackets. These booms are hydraulically controlled. The hydraulic system has its own supply and pressure for operation is provided by an engine-driven pump.

The completed machine was well balanced. Last reports are that everything is working satisfactorily.

Radioactive Lube Oil Speeds Engine Research

RESEARCHERS can tell from minute to minute exactly what goes on inside modern high compression engines. Evaluation tests taking 100 hours, now take a few minutes.

A new application of radioactive materials in lube oil provides an engine "basal-metabolism" for research engineers at The Cooper-Bessemer Corp. As a result, development programs on new materials and designs are expected to be accelerated greatly. This is to meet demands for more horsepower, longer engine life and better fuel economy according to Ralph L. Boyer, Vice President and Director of Engineering.

For example, in large engine development programs, served 100-hp runs are normally required to evaluate the effect of speed and temperature on lube oil consumption. Often, fuel and attendant manpower costs limit research programs. Research project budgets may not be sufficient if long test runs are necessary.

One benefit of C-B's new research technique is the search into the question of when piston rings actually seat. The answer is especially vital in the pipeline compressor stations when engines are overhauled and re-ringed.

In such cases, operators are inclined, through urgency, to put the engines on full load before piston rings are seated. With new information obtained through C-B's research with radioactive lube oil the problem is solved. Manufacturers can recommend with reasonable certainty the earliest period when the engines can be loaded fully without undue danger of scoring or getting premature ring and liner wear.

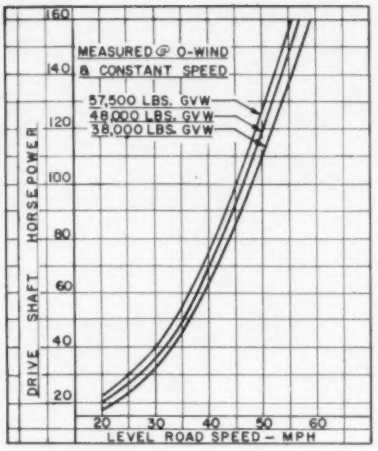
C-B worked in conjunction with the Battelle Institute to develop their new research techniques. The object was to determine what quantities of radioactive materials were required to provide adequate recordings. It was also necessary to find if these additives would make engine exhaust become hazardous. It could be done.

Basic standards of radioactivity in the lube oil set-up in these determinations now measure exactly how much lube oil is by-passing the rings by instrumenting the exhaust. From these readings, what takes place in the cylinder is determined instantly as it happens.

Savings of time and costs in developing new metals for pistons, rings and liners for the higher cylinder pressures of tomorrow's engines are the most promising advantages of these new research techniques.

You Can Get Better Fuel Mileage . . .

All It Takes
Is a Good Knowledge
Of What Factors Influence
Your MPG Figure,
How and How Much.
Here Are Some Ideas
To Start You Off.



DRIVE SHAFT HORSEPOWER
VS
LEVEL ROAD SPEED

▶1

ENGINE "X" uses 0.40 lb per bhp hr at the best point on its fuel consumption curve. Engine "Y" shows 0.43. It figures that engine "X" will give the best miles per gallon performance when installed in a vehicle. Or does it?

Don't make any bets because there are a lot of things to consider. With changing marketing patterns and increasing taxes on diesel fuel, earlier differences between diesel fuel and gasoline costs have just about been wiped out. So emphasis today is on the inherent economies of the diesel.

Engine builders are squeezing out the best fuel performance and longest service life possible. These are fundamental to operating economy. But there is also a lot of research into what might be termed "applicational factors" to determine their effect on overall economy.

Three recent papers* presented before the Society of Automotive Engineers provide the basis for this article. The collective findings give important ideas to consider in selecting original equipment, in operation of existing equipment, and when any re-engining or power train changes are contemplated.

We'll repeat—Good specific fuel consumption is a basic factor. Also, we must assume that a high state of maintenance exists. This clears the field for discussion of other factors such as the effects of . . . .

Source Material: Papers Presented Before Society of Automotive Engineers

*"*Factors Affecting Fuel Economy (MPG)" by J. C. Miller, Cummins Engine Company, Inc.*

"Matching the Engine to the Application" by F. W. Sinks, Detroit Diesel Engine Division, General Motors Corp.

"Practical Aspects of Diesel Operations" by F. R. Nail, Mack Trucks, Inc.

Vehicle Weight and Road Speed

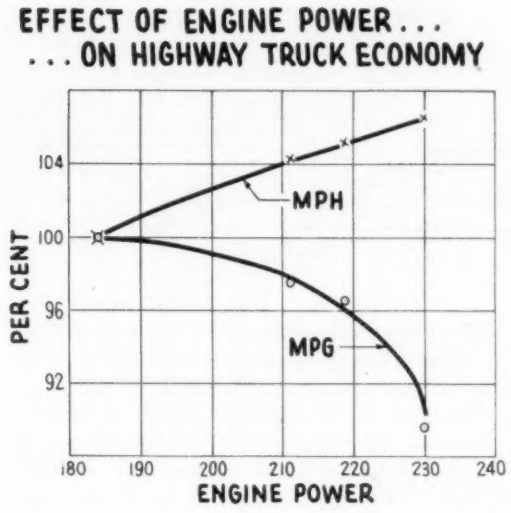
How fast do you want to carry how much? It can make a lot of difference in your mpg figure. Mr. J. C. Miller states in his paper, "Power used in lifting is the dominant factor in fuel mileage in mountain country, rather than speed. However, in most operations, speed is the prime factor in determining mpg as the roads are no more than rolling in most of the country."

Power requirements climb sharply as speed is increased; much more so than when weight is increased. Mr. Miller shows this in a chart, Fig. 1. Shaft horsepower was measured just ahead of the rear axle to limit power readings to those needed to drive the rig.

At 40 mph, a gross vehicle weight increase from 38,000 lb to 48,000 lb (26%) increased shaft horsepower from 64 to 70 (10%). At 38,000 GVW, an increase from 40 to 50 mph (25%) boosted shaft horsepower from 64 to 111 (73%).

Don't kid yourself on this business of speeds. There is little difference between average and cruise speed at 30 mph but this continues to widen as cruise speeds go up. And fuel consumption suffers. Mr. Miller illustrates this in the following Table. Figures were obtained from typical highway runs of a 48,000 GVW tractor-trailer rig.

Cruise Speed	*Average Speed*	*Average As % of Cruise*	*MPG@ Cruise*
30	27.8	93	8.2
35	31.4	90	8.0
40	34.8	87	7.66
45	37.8	84	7.25
50	40.2	80	6.80



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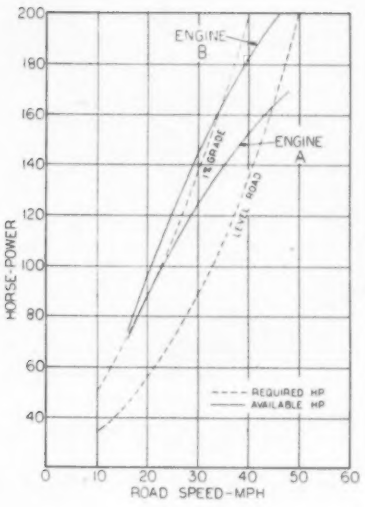

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Here are some points to consider in loading and setting up your schedules. Then there's the question of . . . .

How Much Power?

Engine power requirements vary widely for any application and the span may broaden when comparing the owner's opinion with that of the operator. The owner wants the most work for each gallon of fuel; the operator is interested in performance with little regard for the fuel burned. These points are made by F. W. Sinks in his paper.

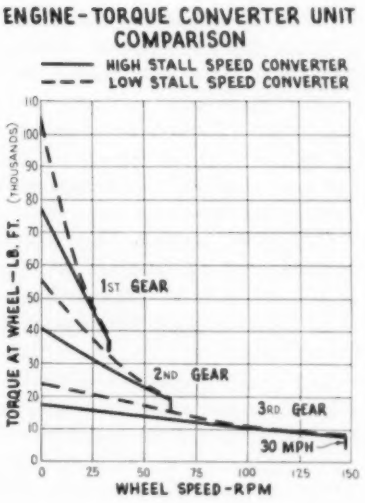
He details a case in which power was increased from 184 to 230 bhp. This 20% power increase decreased fuel economy 9.5% while increasing highway trip speed only 6%. The driver was happy. However, the trip speed increase did not offset the increased fuel cost. And when you figure loading time, coffee stops, etc. in overall trip time, the increase in speed was minimized. The owner was unhappy.

Effect of increased power on highway performance (everything else being equal) is shown in Fig. 2.

Mr. Sinks defines approach to engine selection as follows: "To generalize, . . . a unit must have sufficient power to allow the engine to operate at its designed conditions but not to have too much excess power so that the operator may 'hot rod' and burn fuel with a minimum of overall work done."

Mr. Nail sheds further light on this subject. He introduces the factor of the "proportion of available horsepower used relative to the horsepower required". He shows that two engines of equal specific fuel consumption but of different horsepower will not necessarily produce the same mpg figures under varying operating conditions.

He illustrates this (Fig. 3) by selecting three operating



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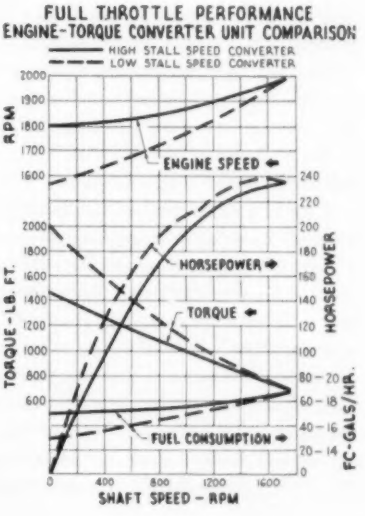

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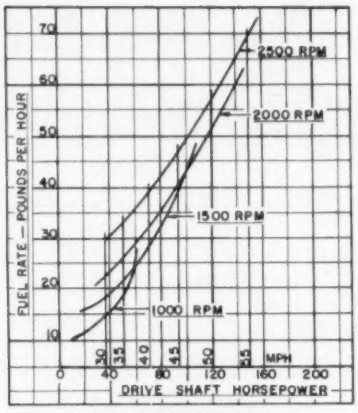
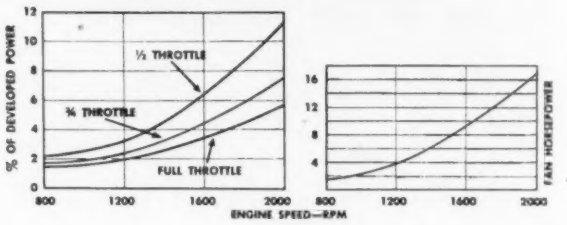


FUEL RATE VS DRIVE SHAFT HP
40,000 GVW

6

7

COOLING FAN HORSEPOWER



conditions. Equipment is the same except for engine horsepower. Engine "A" is a 170-hp diesel; engine "B", a 205-hp diesel. Specific fuel consumption is practically identical.

In the first case, both are assumed to be operating in direct gear. At 45 mph, engine "A" reaches a balancing speed (full throttle operation) on level road. Calculated mpg is 5.07. Engine "B" under the same conditions has excess power. Partial throttle in this case is still in the low portion of the fuel consumption curve and mileage is the same, 5.07 mpg.

Now traffic conditions reduce road speed to 40 mph, requiring 136 hp. Engine "A" operates at 90% load, engine "B" at 74%. Calculated fuel consumption respectively is 5.47 mpg and 5.36 mpg, thus favoring the smaller engine.

Assume a 1% grade. A down shift (figured at 28%) from direct gear is necessary with engine "A" and it will balance out at full throttle with a speed of 35 mph and fuel consumption of 3.94 mpg. Engine "B" will not have to shift as its horsepower curve crosses the 1% grade requirement curve at the 35 mph. However, although at full throttle, its speed will have been pulled down to 1600 rpm and calculated fuel consumption will be 4.22 mpg. This gives the nod to the bigger engine.

So these are all factors to consider in selecting the horsepower for most economical overall results. There is also the item of . . . .

Power Trains

Axle and transmission specialists have done a remarkable job in not only providing efficient systems but in providing a variety to meet just about every need. While some differences in power losses exist, the essential problem is to provide matching that will enable the engine to operate at or near its design conditions while providing the needed torque and speed at the driving wheels.

Basically, engine speed is determined by axle ratios and transmission splits. Proper matching of engine to application is a fruitful area for improvements in mpg's. Additionally, good matching (granting good driver operation) will produce the lowest number of engine revolutions for a given run. This improves engine life as well as fuel economy.

Mr. Sinks cites an example showing the influence of proper gearing. A highway truck's fuel economy was improved from 6.5% at 60,000 lb GCW to 10% at 30,000 lb GCW. There was no change in engine or power train efficiency, only in the gearing. Reason? The engine was operating at more efficient speeds.

Showing that this principle applies to torque converter drives too, Mr. Sinks details results of engine matching with a high and a low stall speed converter. Both converters have approximately the same efficiency throughout their operating ranges. The same transmission was used and converter output shaft speeds equalized by a reduction change in the final drive unit. Results are shown in Fig. 4.

At stall conditions, the low stall speed converter produces 35% more torque at the rear wheels. This diminishes as output shaft speed increases. Results with the transmission removed are seen in Fig. 5. Plus the improvement in torque, fuel consumption improved about 15%.

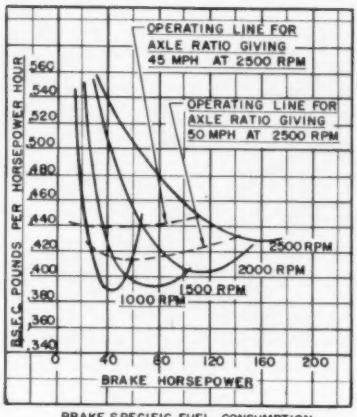
Mr. Miller confirms that "there is usually an optimum combination of engine horsepower, transmission, and rear axle ratio which will produce best fuel mileage for any set of operating conditions." He backs this up with the data shown in Fig. 6. His data also indicates the wastefulness of unnecessarily high engine speeds. Why? This leads to a discussion of . . . .

Gross vs Net Horsepower

Part of the answer to power needs and what fuel mileage you can get lies in parasitic power losses—the system's "overhead". These fall in three general areas—the engine and its environmental conditions; engine and vehicle accessories; and drive component losses.

Engine friction and pumping losses generally increase disproportionately as rpm's go up. Intake air and exhaust system restrictions take their toll. Power losses may result from ambient conditions differing from the standards on which the engine's performance curves are based.

Necessary accessories—cooling fan, generator, air compressor, etc.—take a horsepower bite. Combined with special vehicle accessories, losses are usually substantial. Generally, and specifically in the case of fans, power demand increases with engine speed. Fig. 7 from Mr. Sink's paper illustrates this.



BRAKE SPECIFIC FUEL CONSUMPTION
ENGINE DYNAMOMETER TEST

Drive line losses vary with the number and type of components. Within the framework of the job to be done, it it obvious that these should be minimized by comparison and selection.

Analytical selectivity is one way of reducing the whole vehicle's power losses. Good installational design is another. Also, be aware of the power-robbing effect of higher-than-needed engine speeds in all planning. The more you can cut your "dead horses", the better your mpg figure.

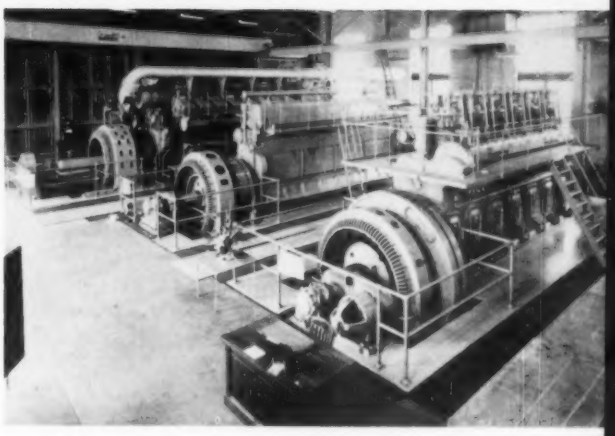
Finally, another important factor in getting good fuel mileage must be considered. It is the effect of . . . .

Good Operation

It's up to the driver. Mr. Miller puts it this way. "With a definite power required to drive a vehicle, engine losses can be great or small, depending on how it is driven. No one would think of driving a passenger car in second gear all the time. Pickup would be terrific and top speed ample for most traffic conditions, but there would be a big loss in fuel economy."

Reasons for this have been shown; higher-than-required engine rpm is wasteful. This is seen in Figs. 6 and 8. Mr. Miller further points out, referring to his "fish hook" curves, that "Each curve has a minimum point. At power less than this, fuel beyond that needed for power is burned just to pump engine air and run accessories. At power greater than at the minimum point, combustion efficiency falls off and more fuel per horsepower is used until a point is reached where there is not enough air to burn all the fuel and smoke increases rapidly." You fellows with "smokers" please note. Power and smoke are not synonymous.

And as a guide for best operation, Mr. Miller says, " . . . tests indicated that large gains could be made if the engine could always be run at the bottom of the fish hook curves. This is not always possible but it can be approached very closely in practical operation by running in the highest gear with which position in traffic can be maintained. This was confirmed by actual road tests under all conditions of load and speed."



DIESEL DEVELOPMENT DELIVERS SAVINGS

MODERN diesel technology is saving money for the user. It is making more power possible in ever smaller packages. Safe increases in rpm and higher cylinder pressures combine to produce more horsepower. Improvements in engine design and increased mechanical efficiency have lowered fuel consumption. And the appetite of diesels is growing broader—including even a residual fuel diet.

Here's a case to point up these diesel developments. These three look-alike Worthingtons have roughly the same cubage. But their side-by-side operation tells an actual progress report.

Before 1931 the City of Independence, Iowa, Municipal Light Plant was run by steam. Then it got its first air injection diesel. Three years later, this 6-cyl Worthington engine in the foreground, producing 750 hp at 225 rpm, was installed.

At the start of World War II another Worthington unit, in the center, was added. This time an 8-cyl oil diesel rated 1000 hp at 327 rpm.

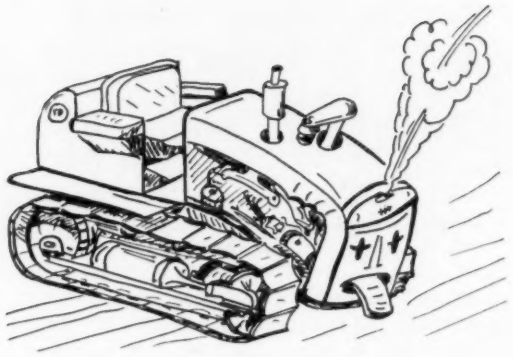
Now this year that third dual fuel engine in the background joined the power line-up. It alone develops more than twice as much horsepower as the other two diesels combined. Rated 4190 hp at 450 rpm, it is evidence of the reality of more and more horsepower in less and less space.

On the basis of the oldest diesel pictured, it would take eight engines to deliver that amount of power. Figure what this would mean in foundation, piping and other construction costs just to house these extra units. Then add the extra expense of all the fuel these engines would eat up and their maintenance costs.

Instead the newest turbocharged Worthington is hard at work delivering far greater horsepower in the same size package as the older units—and piling up fuel savings at the rate of over $100 a day.

Yes, today's diesels are high power producers, space and money savers.

Don't let your engine
run an expensive fever like this
when you can avoid it
by heeding International
Harvester's tips on . . .



Simple Cooling System Maintenance

FIVE 5-room houses could be heated in minus 10°F weather with the heat from a cooling system of a 200-hp diesel at 70% load. That is the heat your engine's cooling system must dissipate continually.

It's easy to maintain your engine's cooling system and to help it do the job it has been engineered to do for your engine. A few minutes with an air hose, a few gallons of water, or a quick adjustment of the fan belt may mean the difference between an efficient engine and one that causes costly delays and unnecessary repairs. For the most part it is a matter of remembering—remembering three simple rules—keep it full, keep it clean, and keep it flowing.

Keep the Cooling System Full

You wouldn't think of operating an engine without coolant, but you may try to get by without enough. A partially-filled system will perhaps operate at 50 to 70% of efficiency. So beware of coolant losses through leaking hose connections, engine side cover gaskets, pump packing and radiator caps.

Leaking is not the only reason for apparent loss of coolant. When refilling a drained system, air may be trapped. When this is purged, the coolant level is low. In thermostatically-controlled systems a vent hole bleeds air around the thermostats while filling takes place. This vent hole *must* be open.

On TD-24 tractors equipped with engine water outlet manifolds incorporating the full-flow by-pass system, inspect the vent hole in the front face of the manifold. Inserting a No. 9 wire will insure that it's fully open. Another aid in filling is to remove the 1-in. pipe plug from the rear of the water outlet header. You may want to install a valve to simplify future fillings.

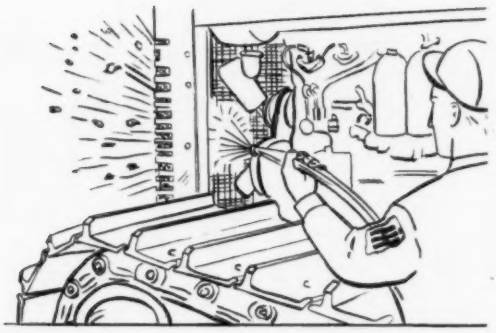
Another reason for loss of coolant may be "after-boil." When running under load a lot of heat is stored in the engine metal. When the engine is suddenly shut down, this heat can be transferred to the water to cause "after boil." Steam formed forces coolant from the radiator's overflow pressure valve. Heated (and thus expanded) trapped air to the system may have the same effect.

This suggests another possible cause of water loss—the radiator overflow pressure valve. This serves a dual function of sealing against coolant loss at extreme operating angles and by pressurizing the system, raising the coolant's boiling point. Correct functioning of this pressure valve (opening pressure 3½ to 4½ psi) is important in maintaining coolant level.

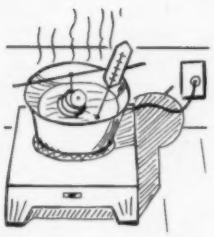
A *full* cooling system is necessary to prevent aeration (too much air in the water). Since the engine is liquid-cooled, not air-cooled, only liquid can transfer enough heat from the engine parts to prevent dangerous overheating.

The illustration shows what happens when the coolant level goes down. When the engine is off, the tubes are just covered. Start the engine and the suction of the water pump will pull the liquid level down below the top of the tubes. Coolant coming back from the engine, rushes into the top tank and traps the air and pushes it through the system. The same thing happens when the engine is at an angle. But when the tractor's cooling system is full, the radiator core tubes are covered even when working at severe angles. Check the coolant level as often as necessary to keep the system full.

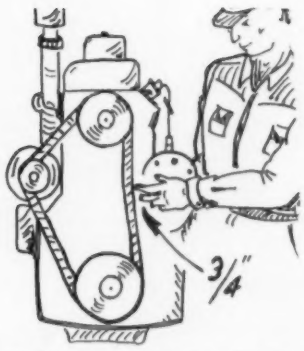
Aeration can be caused also by certain antifreeze solutions and rust inhibitors combining with chemical elements in water to form a coolant that foams readily. Foam (air) lowers the efficiency of the liquid-cooled engine. Use only recommended antifreeze solutions and rust inhibitors. Additives for prevention of foaming are also available.



Reverse-flow, low-pressure air or water flushes dirt.



Simple test rig for thermostats.



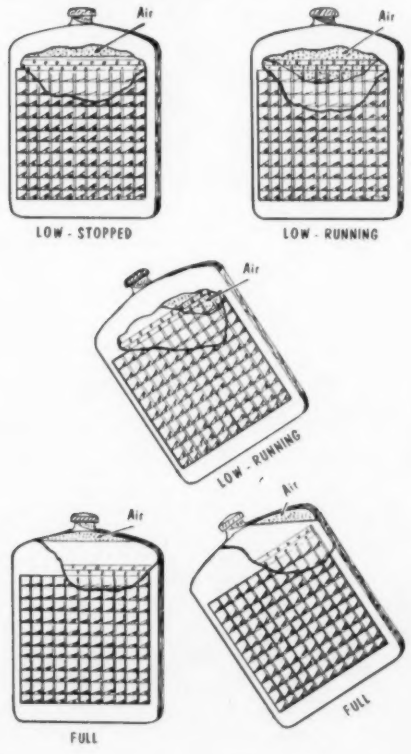
Checking belt tension by deflection.

Keep the System Clean Inside and Out

Lime deposits, scale, rust and corrosion inside the cooling system may also shackle its efficiency. You would not think of drinking muddy water. Be as careful with the water you put in your engine. Use soft clean water and reverse flush periodically to remove any of these unwanted elements.

The radiator, performs best when clean inside and out. Use low-pressure air or water to clean dirt, trash and bugs from the radiator at least once a week.

Why radiators should be kept full. When tubes are uncovered, incoming water traps air, carrying it through system. Full system (bottom) avoids this.



Keep the Coolant Flowing

Belt: The cleanest cooling system in the world won't perform properly unless coolant is flowing through it. The belts used not only turn the water pump but also drive the fan. These belts must not slip. If air flow through the radiator is decreased, the heat from the coolant in the radiator will not be fully dissipated.

Thermostats: Thermostats control flow in the system and should be checked for proper operation. For example, in International Harvester engines they should start to open at 165°F, be wide open (⅜-in.) at 190°F. Full-flow, by-pass manifold system thermostats are full open at 180°F in IH engines. They must function at the specified temperatures to allow unrestricted flow.

Water Pump Impeller: The impeller may become damaged after extended use, or eroded by electrolysis or abrasive material in the coolant. It should be checked when rebuilding the water pump.

Fuel: The IH engine is designed to use efficiently No. 2 Diesel fuel. The wrong type and grade can cause serious cooling problems.

Injection Pump Timing: Tests have shown that to advance timing beyond the optimum setting results in excessive temperatures and decreases output. To set the injection pump timing on IH engines:

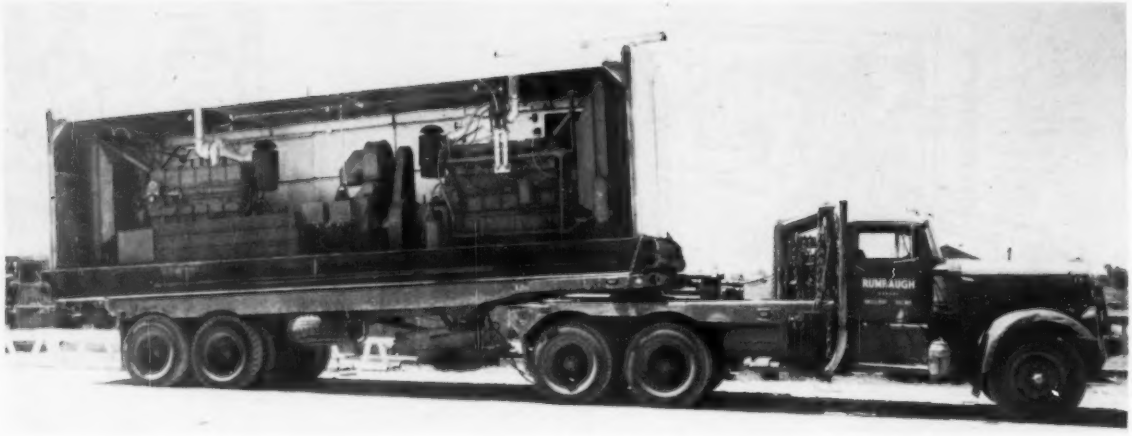
1. Operate the engine until the temperature is up to normal operating range.

2. Starting from the zero or center mark, retard timing by moving pointer (or coupling on "18" series engines) counterclockwise (as viewed from the front of the engine) one mark at a time, until an intermittent miss is produced at high idle, accompanied by light puffs of smoke.

3. Advance timing ½ mark from this point and recheck engine performance at high idle. Repeat if necessary until engine runs smoothly and exhaust is clear. This is optimum timing.

Conclusion

So remember, an efficient cooling system is an engine's best friend. Follow the above steps to keep it full, clean and the coolant flowing.



Diesel Rig Travels Far and Fast to Drill Deep

DRILLING of what may become the world's deepest hole has started near Ft. Stockton, Texas. A heavy-duty drilling rig carried in a 17-truck convoy was rushed in position in record-breaking time.

The Great Western Drilling Co. had the rig unloaded and its major components ready to drill within a day-and-a-half after it left Odessa, 125 miles to the north. The more-than 22,000-ft well is being drilled for the Phillips Petroleum Co.

The rapid move and setting-up was possible because the drilling rig is said to be the first of heavy capacity designed to take full advantage of the high portability possible with diesel-electric drive. The electric drive was built by General Electric's Locomotive and Car Equipment department.

The significance of the race against the clock was pointed up when a drilling company official noted that a drilling contractor can lose as much as $1500 a day while a rig is not producing.

The electric drive is inherently more portable than mechanical drives because its major parts, motors and generators, are connected with flexible electric cable and need not be near each other. It has the equivalent parts of conventional mechanical rigs that take 8 to 10 days to rig up because of the care necessary in preparing the drilling site and aligning all power system parts.

Basically the drilling rig consists of a U-1220 drawworks made by the Unit Rig and Equipment Co. and six 450-hp, 1100-rpm Cummins LRT-600 Turbodiesels. This is the first time this type of engine has been connected to a generator in this way for diesel-electric drilling.

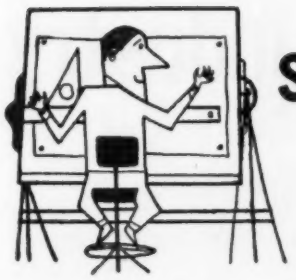
The transmission is GE's S-343 drilling rig package. It is made up of three GE752K drilling generators supplying power to four GE752H shunt-wound drilling motors with a continuous rating of 625 hp and an intermittant rating of 1000 hp for drawworks duty.

Two motors are direct-connected to the drawworks. Each of two mud pumps are driven by a drilling motor. Two diesel engines are direct-coupled to each generator. The rest of the drive equipment includes a main control panel, driller's console, and electric cable.

The mud-pumping system has about twice the storage capacity normally found on a rig of this type. It includes three 50-ft steel tanks and two 30-ft tanks.

The heart of the rig, the power end, breaks up into seven skid-mounted trailer loads. The drawworks and motor assembly makes up two loads, each of the three engine generator power plants form a load and each of the two mud-pump assemblies are a trailer load. A massive derrick has been constructed at the drilling site.

There's a Long, Long Trailer Winding to Ft. Stockton Oil Drilling Site



service section

Recent engine and equipment modifications, procedures and recommendations straight from the different manufacturers to you

Common Lube Oil System for Cat Diesel and Starting Engines

An interconnected lubricating oil system is now used between the vertical starting engine and the diesel engine on D7, D8, D9, DW15, DW21 Tractors, No. 583 Pipelayer and D326, D337, D339 and D342 engines.

This lubrication system supplies pressure oil to the starting engine when either the starting engine or diesel is operating. Thus, while the diesel is operating and the starting engine is stopped, the starting engine bearings are provided with a protective oil film to resist corrosion. Also, the continuous flow of oil minimizes

(*Continued on Page* 76)

New Cummins J Cylinder Head Gasket

A new one-piece, steel-plate type cylinder head gasket, has been released for use on all J series engines. The gasket combines the advantages of the carrier-plate and steel-asbestos type gaskets, giving uniform sealing at the combustion chamber, with cemented grommets at oil, water and stud holes.

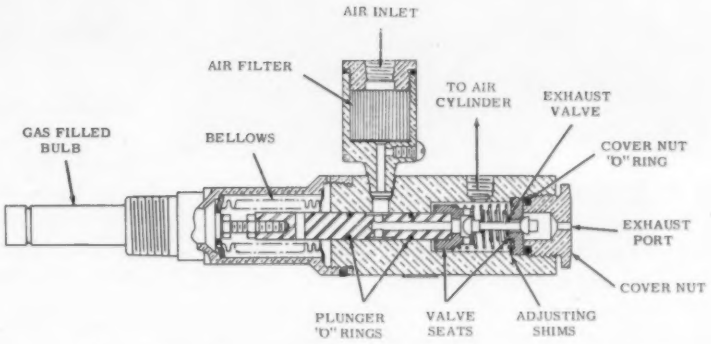
The tightening procedure to be used with the new gaskets is as follows:

A. Install cylinder head and steel plate-type gasket over the cylinder head studs. The word "Top" on the gasket goes up.

B. Lubricate cylinder head stud threads with clean S.A.E. No. 40 lubricating oil.

C. Install washers and cylinder head stud nuts and tighten to 25-lb ft.

D. Tighten all cylinder head stud nuts in rotation as shown in sketch to 280/300-lb ft in 50-lb ft steps. All nuts must be tightened in any one 50-lb ft step before going to the next step.



Radiator Shutter Maintenance On IH 65 & 95 Payhaulers

A Hardy shutterstat valve is used to regulate the radiator shutters which are either fully open or fully closed to maintain 180°F coolant temperature in the engine. The shutters are mechanically opened by spring tension and closed by thermostatically controlled air pressure.

When the engine is first started, the shutters are opened by spring tension in the valve. As air pressure builds up, air is allowed to pass through the valve to the cylinder which closes the shutters. When coolant exceeds 180°F, the thermostatically controlled gas filled bulb in the valve closes off the air, exhausting cylinder and allowing spring tension to open shutters. When coolant temperature drops, the air valve retracts allowing air pressure to close the shutters.

Maintenance

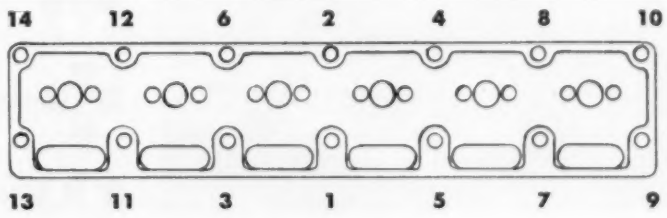
Occasionally remove excess dirt from the shutter blade bearings with compressed air. Bearings may be lubricated sparingly but after the shutter is worn in, frictional wear will be slight and excessive lubrication will only increase dirt collection. If it sticks, lubricate the air cylinder piston rod with a light film of waterproof grease.

If air escapes from the exhaust orifice after the shutters are fully open or closed, inspect the exhaust valve and seats, the O-ring on the cover nut, and the valve plunger O-rings.

Failure of the thermostat bellows or loss of gas from the bulb will result in the shutters remaining closed.

Adjustment

The valve is adjusted at the factory to open at 180°F. However this can be readjusted if necessary, by adding or removing shims under the exhaust valve seat (see illust.). Removing one of the shims will lower the operating temperature approximately 6°F.



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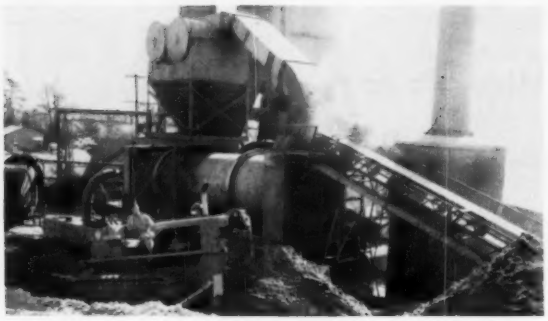

IH Dozer Services Hot Mix Plant

The road building program keeps this International crawler tractor with dozer blade busy. IH TD-18 unit, shown dozing material at Greensboro, N. C., hot mix plant, daily dozes 1600 ton of mix material and handles the spotting of all railroad cars at the siding. About 20 cars are unloaded by clam shovel each day. Then the material is stockpiled by the dozer and later fed into hoppers by the unit.

Diesel Delivers Power During Mock Air Attack

On July 12 during "Operation Alert, 1957", the City of Indianapolis experienced a mock enemy air attack as part of a nation-wide Civilian Defense exercise.

Under the simulated emergency conditions, all electric power was knocked out. Here Gov. Harold W. Handly turns on the standby power unit—General Motors diesel 100-kw at 1800 rpm generator set. This Model 6150 mobile unit is mounted on a GMC ton-and-a-half chassis. It was equipped with both high and low voltage control cabinet along with automatic starting.

Civilian Defense officials have come to recognize the need for dependable standby diesel-electric power in emergencies. Many Detroit Diesel mobile generators are now used by Civil Defense teams, police and fire departments throughout the country.

Absolutely Free to Cummins' Customers

Cummins distributor, W. B. Lawrence, Syracuse, N. Y., lends this tractor for free. When truckers are stymied by one of their fleet being out of operation for purpose of conversion, this "loaner" with a rebuilt JT-6-B diesel and 19 Brockway chassis, is at their service. No charge is made. The customer just pays for fuel, oil, grease and other items used while borrowing the truck. Mighty big convenience to Cummins' customers and a good-will builder!

Cloudy Cargo

No, this LeT-Westinghouse D Rear Dump isn't hauling clouds. It's steaming hot slag, waste material from processing phosphorus at Monsanto Chemical Co. Run molten at 2500°F into pits, it is quenched with water sprays to solidify it. Then it's loaded into haulers which carry 30,000 tons of this waste to the dump each month.

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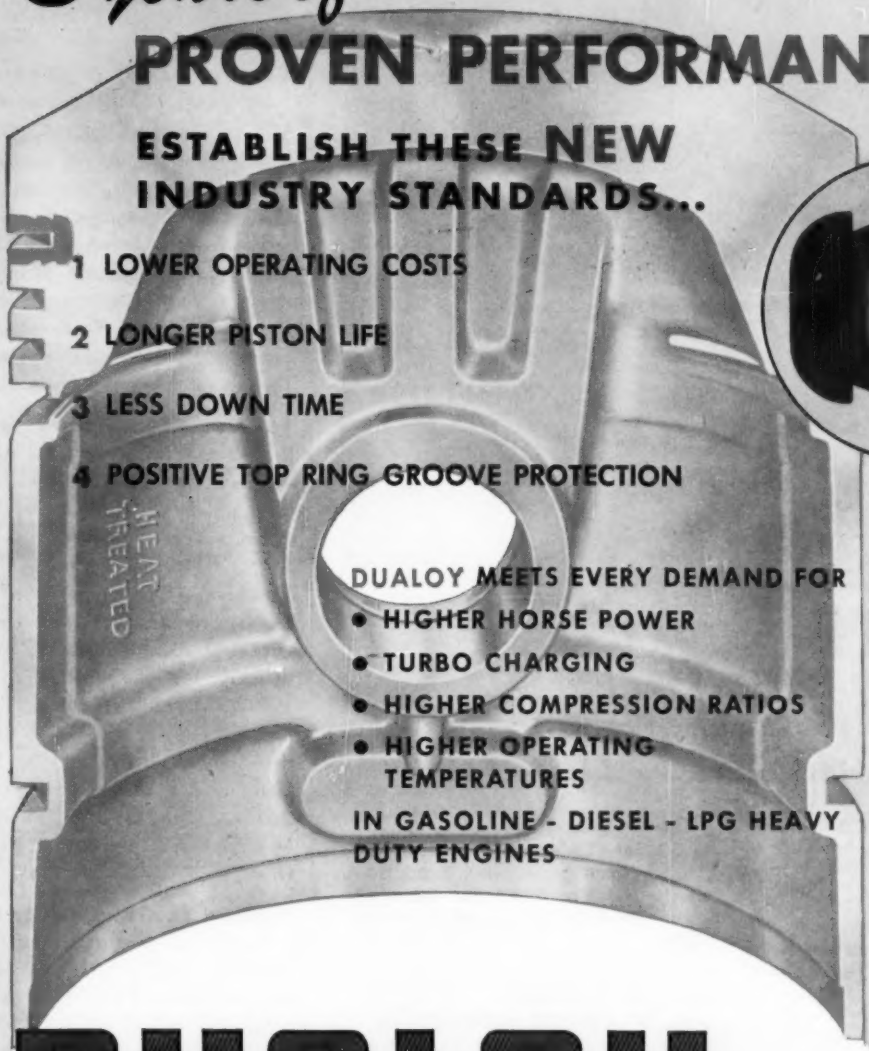

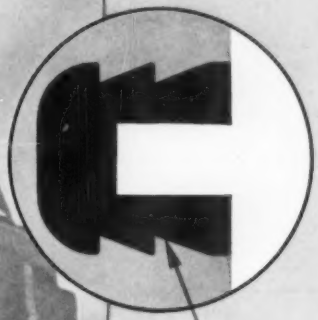

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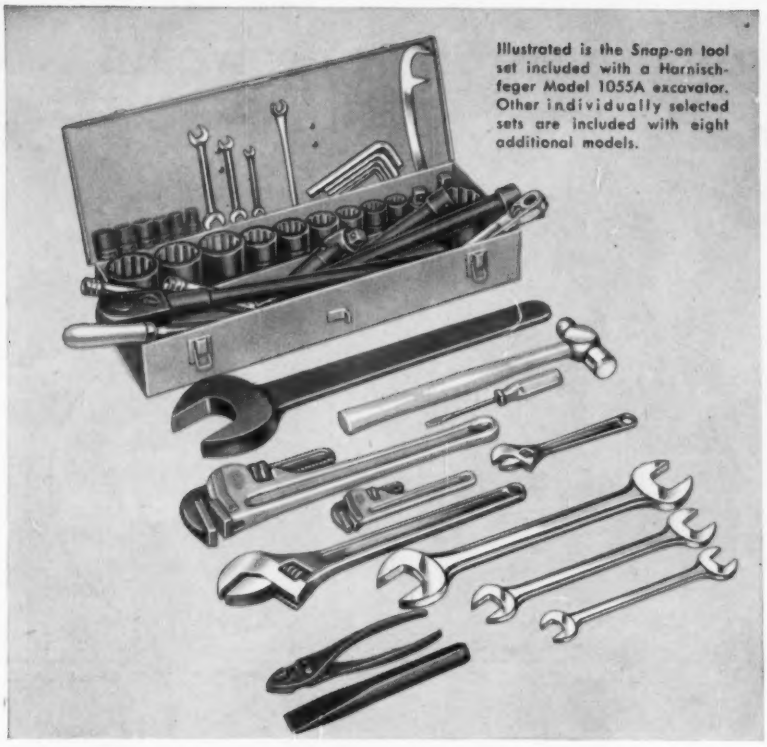

Illustrated is the *Snap-on* tool set included with a Harnischfeger Model 1055A excavator. Other individually selected sets are included with eight additional models.

Snap-on*

lives with an excavator

HARNISCHFEGER

provides a hand-picked tool kit

Each *Snap-on* tool kit Harnischfeger Corporation includes with a new excavator is specifically designed for that particular model.

These tool sets are the result of an analysis suggested by R. J. Ripple, *Snap-on* sales engineer. After preliminary discussions, Ripple brought in a wide selection of *Snap-on* open-end wrenches, sockets, Torqometers and other tools. Then, working from the ground up during assembly of an excavator, this *Snap-on* specialist, together with Harnischfeger erection and engineering people, selected by actual trial the proper tools to go with the machine.

The complete survey involved at least eight different models and extended over a period of many weeks.

These tool sets make maintenance jobs faster, easier, and better. In addition, factory engineers now carry only a minimum of extra tools for erecting excavators in the field.

GOT A TOOL PROBLEM?
CALL THE *SNAP-ON* REPRESENTATIVE

Tool kits for original equipment, tools for production and maintenance, tools for field service work—whatever the problem, talk it over with your *Snap-on* man. He is a specialist who devotes all of his time to industrial application of nationally accepted *Snap-on* tools. Branch offices and warehouses are located in 54 cities throughout the U.S. and Canada. Consult your phone directory or write us.

SNAP-ON TOOLS CORPORATION

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*Snap-on is the trademark of Snap-on Tools Corp.

news of our industry

GM Overseas Power Plants

First three of seven new General Motors "Electro-Mobile" 1000-kw, diesel-powered electric generating units have been installed at La Castellana Power Station. All units were recently delivered to Empresa Electrica de Guatemala, electric utility subsidiary of American & Foreign Power Co., New York. The power plants will protect and improve service to customers in Guatemala City.

Fairbanks, Morse Sales Tally

Recent sales score of Fairbanks, Morse & Co. tallied 26 diesel units.

Four 6-cyl, 450 hp Model 38F5¼ diesel generator sets will go to the U. S. Navy Purchasing Office in Brooklyn. Other units vary widely and are bound for scattered points.

One Model 45B3-⅛, 5¼-hp diesel generator set will be shipped to P. S. Pell & Co., Ltd., Honolulu. Two 10-cyl, 3500-hp, Model 31A18 basic oil diesel engines will go to the City of Homestead, Florida. One 2-cyl, Model 48A3-⅛, 13½-hp diesel was bought by L. S. Baier & Associates, Portland, Oregon.

Residual Fuel Purification

Continuous centrifugal purification of heavy residual oils for diesel fuel is the subject of a technical report just released by Sharples Corp. It explores the problems encountered and the progress made in developing improved methods and equipment for this operation.

Called "The Centrifuge and Residual Fuels for Diesel Engines", the 20-page review also describes the new Sharples self-cleaning recycle system which eliminates shut-downs for bowl cleaning of the centrifuge. This system is now in service in both power plants and marine installations for heavy fuel oil purification.

Fill in the reply card provided in this magazine for your copy of this report.

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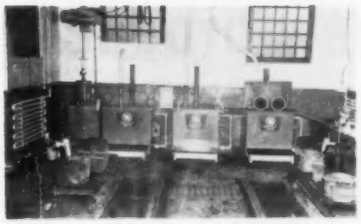


Modern Cleaning Methods

Automation in cleaning has gone far in outmoding the old greasy pail method. Now equipment such as Magnus agitating machines, make short shift of cleaning parts in industrial plants, railroad and repair shops.

In one midwest diesel railway shop, journal boxes travel by crane to a steam-heated Magnus Aja-Lif cleaning machine. Agitation at 100 motions per minute deep-clean the unit for less than 15 minutes. All hand scrubbing is eliminated. Two other machines with rollers and carrying platforms take care of bearings and other parts. A conveyor tran fers baskets filled wih parts from cleaner to rinse tank, then on to the inspection table.

The old way, two mechanics and two men for hand washing were needed. Now three mechanics work on servicing components—with very little time out for simplified cleaning operations. Yes, using automation in cleaning does the job, better, quicker and at less cost.

Quick Delivery On Small Industrial Trucks

Getman Brothers have introduced a new Scoot-Crete truck for construction, mining and other industries. Custom-made, this little truck is powered with Deutz air-cooled diesels imported from Kloeckner-Humboldt-Deutz AG by Diesel Energy Corp.

One man can load, drive and dump the Scoot-Crete carrying loads up to 3500 lb at speeds to 15 mph. It can climb grades up to 25 deg and can be used in plants, outside or underground.

Production schedules, Getman state-, assure delivery within one week to ten days.

(*Continued on Page* 75)

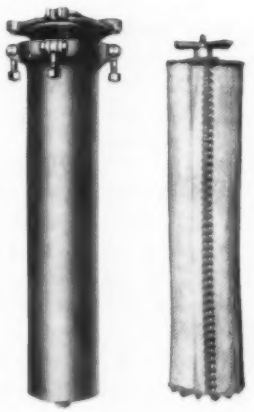
IN THE *Silent Service*

NUGENT FILTERS
protect motor drive bearings aboard the U.S.S. NAUTILUS

On 17 January 1955, the U.S.S. Nautilus, world's first nuclear-powered submarine, made her maiden voyage. Since that historic day, she has traveled well in excess of 60,000 miles. Built as a "true" submarine, by the Electric Boat Division of General Dynamics Corporation, Nautilus has logged the greater portion of her travels while totally submerged.

For duty such as this, both the men and equipment that serve aboard her must be rugged and dependable. We are justly proud that Nugent lube oil filters were selected to provide positive full flow protection for the motor drive bearings aboard the Nautilus. They filter all the lube oil in circulation every cycle before it goes to the bearings, removing harmful impurities before they can reach and damage vital parts.

If your equipment demands the ultimate in filtering protection it will pay you to investigate the advantages Nugent offers. Write for full information.



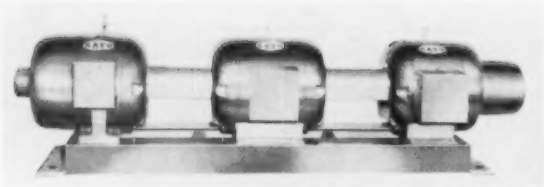
Nugent bag-type filters Fig. 1116 HA-4L protect motor drive bearings aboard the Nautilus. Filter cartridges are Fig. 1116 CE-4L.

Established 1897 — Wm. W. Nugent & Co., Inc.
3426 Cleveland Street — Skokie, Illinois

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Representatives in Boston • Cincinnati • Detroit • Houston • Los Angeles • New Orleans • New York • Philadelphia • Pittsburgh • San Francisco • Seattle • St. Louis • Tulsa • Representatives in Canada: Montreal • Toronto • Vancouver • Winnipeg

new products



Motor-Generator Set Assures Constant Power

Despite possible ac input line failures, continuous ac output is provided by this new KATO generator set. Mounted on a common welded steel base and coupled directly together are, from left to right, dc motor, ac motor and ac generator. Operating speed is 1800 rpm. Both the induction motor and the dc motor are 7½ hp. Alternator rating is 3500 w, single phase, 115/230 v.

The dc motor is equipped with a speed control. When ac input fails, an automatic transfer switch brings in the dc drive motor which operates from storage batteries or other dc source.

Entire length of the unit is 80 in. Various sizes and types of these motor-generator sets have been developed by Kato Engineering Company with single or 3-phase ac or dc output.

New Medium-Capacity Scraper

Model TS-160 is the latest hydraulic motor scraper to join the line of Allis-Chalmers. With a 7-cu yd struck capacity and 12-ton payload, it is a good performer in close quarters.

Its 6-cyl supercharged diesel is rated 155 hp at 2200 rpm. Five-speed constant-mesh transmission fully utilizes high torque output from the engine. Forward speeds range from 3.1 to 25.4 mph and reverse at 3.1 mph.

One piece, all-steel tractor frame gives rigid support for engine, clutch and transmission. Components are easily serviced without disturbing adjacent parts. A relief valve in the steering system protects the hydraulic system from excessive shock if one wheel hits an obstacle. Full-flow filtering insures clean hydraulics and efficient operation of all controls.

Earthmoving Units Make Hard-Working Team

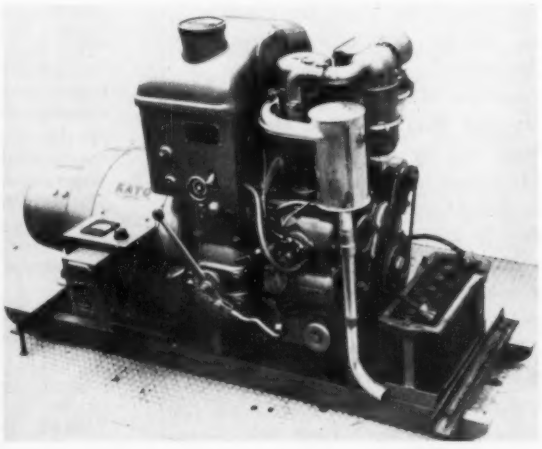
Latest team to pair up is Caterpillar's DW15 tractor with No. 428 scraper. The prime mover incorporates design changes in the engine and power train for longer life and ability to work at faster speeds.

The matching scraper utilizes the full diesel output. Increased apronlift facilitates faster loading. The scraper has a 13-cu yd struck and an 18-cu yd heaped capacity. Together these Cat units make an efficient earthmoving team.

Cold-Starting Diesel Generator Sets

Complete independence from water, radiators, antifreeze and water pumps is a feature of the generator units being marketed by Crossfield & Nicholson Co., Deutz distributor. Called "Dieselight", the new series of diesel-electric generator sets incorporate Deutz air-cooled diesels and Kato alternators.

The engine has good cold-starting qualities, being capable of starting at minus 20°F without external heaters. Fuel economy is another benefit claimed for these units. The generator sets are available from stock in 13 sizes from 5 kw to 125 kw.



Light-Duty Steam Cleaner

Clayton Manufacturing Co. has brought out a 60-gal capacity steam cleaner for light duty general utility cleaning.

The compact unit, they state, develops steam fast with enough impact for deep penetration for dirt and grime removal. This No. 60 cleaner is self-contained and operates on any water pressure, requiring no auxiliary pump. The unit has a 10-yr service guarantee against excessive and recurring service charges.

Clayton has also announced a five-year warranty on its steam generators used for steam cleaning. The guarantee insures replacement of any Clayton generator coil within the first year of normal use without cost—including labor. Thereafter coil replacement is charged pro rata—20% after one year, 40% after two years, etc.

New Lubricant For Free-Piston Engines

Shell Oil Company, N. Y., has introduced a detergent lubricant to meet the severe requirements of free-piston gas engines. Six years of research and testing went into the development of Talona Oil 220. It is reported to minimize ring and cylinder liner scoring, reduce deposit formation in engine case and on compressor delivery valves.

For more details on any of these products, just fill in the postal card inserted in this publication.

Standard **Young** Units
solve SPECIAL cooling problems

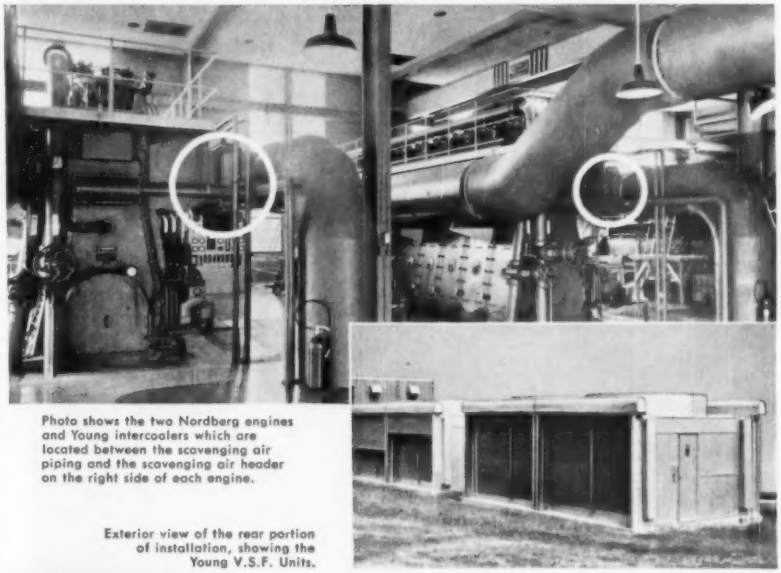


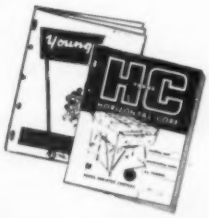
Photo shows the two Nordberg engines and Young intercoolers which are located between the scavenging air piping and the scavenging air header on the right side of each engine.

Exterior view of the rear portion of installation, showing the Young V.S.F. Units.

Young Intercoolers and VSF Units combine to provide flexible cooling

Limited water resources influenced the choice of coolers for these two 3870 hp Nordberg engines. Young Intercoolers reduce air temperature at engine intake air header, increasing efficiency in hot weather.

Two Young VSF Units arranged in parallel provide for optional use. Each has two 2-speed motor-driven fans. Vertical rolling doors control atmospheric cooling. Automatic control bypasses water around coolers to maintain desired jacket temperatures. All fans are controlled from panels alongside each Nordberg engine.



A special problem doesn't necessarily require special equipment; see Young about it first.

Write today to Dept. 417-J for catalogs 1652 and 550.

Young RADIATOR COMPANY
RACINE, WISCONSIN
Creative HEAT TRANSFER ENGINEERS
Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

THIS REBUILT CRANKSHAFT IS DYNAMICALLY BALANCED BY A NATIONAL FORGE SPECIALIST

The same close tolerances that we apply to new crankshafts govern your National Forge *reconditioned shafts.* They, too, are dynamically balanced to *original requirements* after they have been straightened, ground, chromium plated, and ground and polished.

Because National Forge is a specialist in both new and reconditioned crankshafts, we can guarantee your rebuilt shaft will meet the original shaft's specifications.

May we quote on your next job?

This is a finished, repaired crankshaft after processing by National Forge.

For more details on crankshaft repair, write for Bulletin RC-3.

NATIONAL FORGE
AND ORDNANCE COMPANY
IRVINE, WARREN COUNTY, PA.

new products

New Commutator Brushes Have Long Life

Two grades of silicone-resistant brushes have been developed by Speer Carbon Co. Improved commutation and longer brush life are possible with these E-26 and E-32 brushes. They are specifically designed to offset excessive brush wear created by silicone vapors.

The new brushes are endorsed by the maker for use on such silicone-insulated equipment as seaboard motors and generators, industrial equipment operating under explosive conditions and semi-enclosed mill-type motors.

E-26 is a high-contact drop grade electro-graphitic brush. E-32 is a very high-contact drop electro-graphitic brush for equipment presenting particularly severe commutating problems. Both grades of silicone-resistant brushes are available in a wide range of sizes and designs for different applications.

Nylon Webbing Slings

Caldwell Co., Inc. announces two new groups of Liftex Nylon webbing slings.

The Liftex neoprene buffer slings offer a more positive load contact when handling highly polished shafts such as crank and camshafts. Safe working load for these ranges from 5000 to 13,500 lb. Safety factor is 5 to 1.

The other type is a lightweight, economical Liftex nylon sling with a safe working load of 2800 lb in basket hitch and 1050 lb in choker hitch. The safety factor of these slings is also 5 to 1.

In extended field tests both types were found by the maker to have a higher coefficient of friction and to hold more firmly than other types tested. Other advantages stressed by Caldwell are complete resistance to abrasive and cutting edges, high strength and low weight, fast, complete recovery from shock loads and low moisture absorption. No rivets or metal are used in the construction of the slings to assure scratch-free handling of highly-finished loads.

new products

Remote Valve Positioner

Val-Con is a new electric control for remote valve positioning. Made by Sparton Corporation, the device features upper and lower valve limit signals, plus indication of valve position on a color-coded 6-in. meter. This indication is independent of all normal telemetering functions. Thus an operator can positively determine when the valve is open or closed.

Two independent visual alarms are included to signal power failures, pressure, temperature or overload. The unit operates with present motor controllers over a few feet to many miles. Housed in a NEMA 1 enclosure or available for panel mounting, the Val-Con is said to have overall system accuracy of 2%, a repeatability of ½% and a sensitivity of ¼%.

Piping Problems?

Aeroquip has an answer to some of your piping problems. They've developed hose elbow fittings which simplify hose installation in confined spaces and number of joints and fittings required.

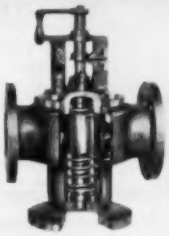
Chief advantages claimed for the new fittings are less flow restriction, more space-saving and reusability. Also, less joints mean fewer possible points of leakage.

These fittings are fabricated from formed tubing. They are available in swivel nut ends with JIC and SAE threads. Mating adapters are also supplied for straight gasket seal and pipe threads. All parts are steel.

Manufactured in 45 deg and 90 deg configurations, they are designed for use with Aeroquip medium and high pressure hose. Both short and extended length elbows are available. Applications include any hydraulic, fuel, air, water or lube oil installation requiring a short radius connection. Swivel fittings tighten without twisting the assembly. Assemblies with double elbow fittings may be angled to the positioning required.

(*Continued on page* 70)

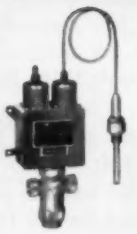
FULTON SYLPHON ENGINE CONTROLS
fit the engine and the danger



No. 1280. (No. 1281 similar, but no manual operator)

PREVENTS INEFFICIENT OPERATION
All-in-one control. Holds cooling water or lubricating oil at constant temperature. Unaffected by pressure changes.

Any engine's safer with a Fulton Sylphon safety control or temperature regulator. Because of the wide variety, you can always find the one best for your purpose. And the "heart" of each and every one is the Fulton Sylphon seamless metal bellows—unmatched for accurate, trouble-free performance.



No. 530

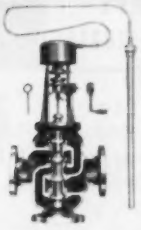
STOPS ENGINE
Safety control shuts off fuel if water temperature goes above or lube pressure goes below safe point. Fail-safe.

No. 953-E

POSITIVE PROTECTION
Operates in conjunction with No. 530 to stop gas or dual-fuel engines. Shuts off gas supply and vents fuel system.

No. 539

4-WAY SAFETY
If water temperature or lube pressure exceeds limit, No. 539 operates alarm, light or pilot, or stops engine.



No. 923-3WB

BIG ENGINE CONTROLLER
Holds jacket water or lube oil at desired temperature. Special 3-way valve maintains constant volume of water.

FULL DETAILS GIVEN IN BULLETIN No. 817-RD
Write for your copy

Mr. Controls
Robertshaw-Fulton
CONTROLS COMPANY
FULTON SYLPHON DIVISION • Knoxville 1, Tennessee

organizational news

New Eaton Administrator

Election of Frank Ivor Goodrich as vice president-administrative of Eaton Manufacturing Co. was announced by John C. Virden, chairman and president.

Mr. Goodrich succeeds F. H. Mott who continues as director after 38 years of service. Prior to his election, Mr. Goodrich was staff assistant to Mr. Mott. Now he will direct activities of all Michigan plants.

Frank Ivor Goodrich

Charles E. Martin

New Service Head at Cummins

The new general service manager at Cummins Engine Co., Inc. is Charles E. Martin. He was also named a member of the executive committee, it was announced by R. E. Huthsteiner, president.

Mr. Martin has assumed overall responsibilities for the Service Division. He succeeds H. E. Bollwinkel who resigned.

A bachelor of science graduate from Purdue, Mr. Martin joined Cummins in 1943 and has served in both the Sales and Service Divisions.

Promotions at Worthington

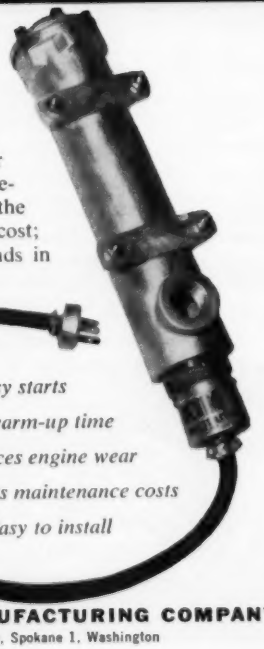
A. William Fraser is the new general marketing manager at Worthington Corp. With the company since 1929, he steps up from the position of commercial vice president in charge of district sales offices.

Also announced is the promotion of William A. Meiter to vice president of employee relations and organization development. He formerly held the post now assumed by Mr. Fraser.

A. William Fraser

KIM Hotstart electric pre-heater for Diesel Engines

KIM HOTSTART pre-heaters circulate hot water through engines when they are not in use; protect them against bitter winter weather; keeps engines responsive to the touch of the starter. Lightweight; low cost; high in savings. Thousands in use.



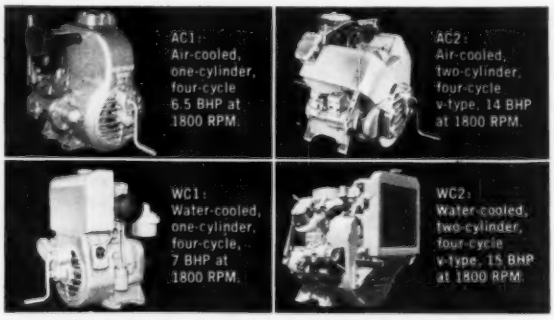
★ *Quick easy starts*
★ *Saves warm-up time*
★ *Reduces engine wear*
★ *Cuts maintenance costs*
★ *Easy to install*

Write for literature.

KIM HOTSTART MANUFACTURING COMPANY
West 917 Broadway, Spokane 1, Washington

THE BIG 4 IN DIESEL POWER

AMERICAN MARC Inc. dominates the field of lightweight, low-horsepower Diesels by building its diversified line from the "Big Four" basic models illustrated here. Purchase and maintenance of engines and parts are simplified by the use of these compact and rugged prime movers.


AC1: Air-cooled, one-cylinder, four-cycle 6.5 BHP at 1800 RPM.
AC2: Air-cooled, two-cylinder, four-cycle v-type, 14 BHP at 1800 RPM.
WC1: Water-cooled, one-cylinder, four-cycle, 7 BHP at 1800 RPM.
WC2: Water-cooled, two-cylinder, four-cycle v-type, 15 BHP at 1800 RPM.

AMERICAN MARC also manufactures Diesel generating plants from 3 to 10 KW (AC or DC, and industrial three-phase), Diesel pumping units from 48 to 1700 GPM, marine propulsion, refrigeration units and power-packages for other services. American MARC can adapt any of its Big 4 engines to fit every job requiring from 5 to 20 BHP.

INQUIRIES ARE INVITED FROM DISTRIBUTORS AND DEALERS.

AMERICAN MARC INC.
DIESEL ENGINES
1601 West Florence Ave.
Telephone OR 8-7174
Dept. F 97
Inglewood, Calif.
AMERICA'S LARGEST MANUFACTURER OF AIR-COOLED DIESELS

Intake and Exhaust NOISE

Pipe System PULSATION

Stopped with

BURGESS-MANNING SNUBBERS

The Burgess-Manning Snubbing Principle has been engineered to effectively eliminate the costly and nerve-racking problem of noise and pulsation. We have, for many years, specialized in the science, cause and effect of noise and pulsation problems. We have adapted the Burgess-Manning Snubbing Principle to many and varied problems in every branch of industry to increase production, minimize maintenance, eliminate this serious source of compensation claims and improve public and employee relations. Burgess-Manning Snubbers are available with such plus features as: air cleaning—or, spark arresting—or, surge control—or, water separating—or, heat recovery.

Let us engineer your noise and pulsation problems right out of existence.

Write for Case Histories.

Sound Engineering

BURGESS-MANNING COMPANY

731 East Park Avenue, Libertyville, Illinois

Dallas, Texas

KIENE® DIESEL

PRESSURE INDICATOR

gives compression and firing pressures faster

SIMPLE
RELIABLE
COMPACT

Send for Bulletin K-100

The Model K-100 Kiene Pressure Indicator accurately measures compression and firing pressures — assures the proper maintenance of diesel engines — helps prevent costly down time. Only one moving part — no friction or inertia effects — no complicated adjustments.

KIENE DIESEL ACCESSORIES, INC.

10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

organizational news

Joins Borg-Warner

Tom Conway has been appointed director of manufacturing services of Borg-Warner Corp. Since 1954 he had been general works manager of the Lycoming Division of Avco Corp. Previous to that, Mr. Conway was with Chevrolet Division, GM, for 17 years.

Heads Elliott Branch

Elliott Company, Jeannette, Pa., announces the appointment of H. J. Campbell as their Kansas City district manager. A mechanical engineering graduate of the University of Nebraska, he joined Elliott in 1943 after considerable engineering experience.

H. J. Campbell

Borg-Warner Australian Appointment

Walter E. Spieth, previously manufacturing vice president of Reo Motors has been named master mechanic of Coote & Jorgensen, Ltd., Australian subsidiary of Borg-Warner Corp.

Mr. Spieth also has served as general superintendent of the transmission division of Clark Equipment Corp.

Two New Cat Representatives

Emil E. Grob is now earthmoving representative in the Eastern Sales Division of Caterpillar Tractor Co. He will serve dealers in Virginia, Maryland and North Carolina. Mr. Grob joined Cat in 1952 as a trainee.

Another Caterpillar appointment is that of Joseph M. Johnson. He has taken over as earthmoving representative in the Southwest Sales Division, covering Nevada, Utah, Arizona, California and Hawaii. In 1953, Mr. Johnson also joined Cat as a trainee.

Paul Jordan

Heads Dodge Engineering

Paul Jordan is promoted to director of engineering, it's announced by David Firth, vice president in charge of engineering.

In his new position Mr. Jordan will direct all engineering and development work, reporting to Mr. Firth. He has been a key figure in extensive plant expansion nearing completion in Mishawaka.

Returns to IH

Abel A. Medlin, formerly with International Harvester for 16 years, has returned to that firm after four years with Dodge Division, Chrysler Corp. Mr. Medlin will serve as supervisor of the newly-created used equipment merchandising department of that Division.

organizational news

Election at Studebaker

Carl F. Giese has been elected to the board of directors of Studebaker-Packard Corp. Mr. Giese is also a director of Daimler-Benz, A. G., Stuttgart, Germany, diesel manufacturers, and is president and managing head of its operations in North America.

Studebaker-Packard, through its dealer organization, is marketing Mercedes-Benz cars and trucks.

New Division Formed By Alpha Molykote

Increased demand for engineering data has brought about the organization of a Technical Services Division of Alpha Molykote Corp. It will be directed by Harry S. Gerstung.

Also announced is the transfer of Dr. Josef Gaensheimer from the firm's basic research group in Germany to the Stamford, Conn. laboratories.

Clark Bros. Branch Added

Clark Bros. Co. has opened a new office and warehouse at 800 Central Expressway, New Orleans, La. John Cooper heads the branch which serves Louisiana, southern Mississippi and southern Arkansas.

New Sealed Power Plant

Another 70,000 sq ft will be realized by Sealed Power Corp. when a new $500,000 distribution center is completed in La Grange, Indiana. The facility will handle distribution of all the company's replacement products to its 22 regional branches throughout the United States. Replacement warehousing operations now located at the Muskegon plant will be transferred to this new location.

The one-story building will furnish nearly 50% more area than now available. About 80 to 90 people will be employed there. William H. McKinley, director of the Warehousing Division, will head up the La Grange operation.

Representing Cat

John E. Pilon steps up to the post of district representative for Caterpillar Tractor Co. in its Southwest Sales Division. He will work out of the company's San Francisco office and serve dealers in Marysville, Sacramento and Colusa in California and Salt Lake City and Reno in Nevada.

Weatherhead Adds to Staff

Ralph H. Galloway has been named sales engineer for the Fort Wayne Division of the Weatherhead Company. He will supervise sales for the Industrial Distributor Division in southwestern Ohio, southern Indiana and Kentucky. Previously, Mr. Galloway was with U. S. Rubber Company.

Mack Branch Manager

E. L. Mays has been made manager of the Washington, D. C., Branch of Mack Trucks, Inc. He succeeds Forbes T. Milliken, now manager of the Portland, Ohio, Branch.

Long active in the trucking industry, Mr. Mays was formerly with Reo Motors, Inc.

Dependable, Trouble-Free! Gentlemen,

"I know. It's the shoe that supports the crosshead in this Ingersoll-Rand compressor. It's all one piece because this Alcoa alloy is strong, needs no hard backing."

"Sure, that's how Alcoa makes bearings. Nothing to come apart. No hard backing to damage other parts in the unlikely event of bearing failure."

organizational news

Joins Parker

Appointment of James C. DuBois as sales engineer for tube and hose fittings, hydraulic accumulators and check valves is announced by Parker Appliance Company, Cleveland. Mr. DuBois will headquarter in Toledo and cover a new district made up of northwestern Ohio plus adjoining counties in Michigan including Wayne.

Flexonics Expanding

Flexonics Corporation will build a 25,000-sq ft plant on a 10-acre site at Santa Ana, Cal. The building will house special industrial production and assembly. It will also stock Flexonics full product line for west coast markets. Heading up this new Division is Kenneth Kampenga as factory manager.

The company's products include flexible metal hose, expansion joints, metal bellows, thermostats and industrial hose.

Joins Wyman-Gordon

Joseph R. Carter has been selected as manager of operations, Eastern division of Wyman-Gordon Co., forgers. Last with Pittsburgh Steel, Mr. Carter's career in this industry covers a 21-year period.

New Lab for Johnson Bronze

Johnson Bronze Co. plans building a new half-million dollar research laboratory to double its present facilities. All activities concerning research and product engineering have now been combined into one unit under the supervision of James W. Butler, Jr.

Aims of the new department will be to broaden the product line, improve customer service and find new applications for existing products. The new laboratory will also house the company's quality control department directed by William Mannella.

Also announced by Johnson Bronze is the promotion of Fred G. Moser to manager of original equipment sales. Mr. Moser first came to this firm in 1942 as a floor inspector, moving up steadily to this latest position.

IH Names Works Manager

International Harvester Co. has promoted P. A. Becker to works manager of its Melrose Park Works, Construction Equipment Division. He succeeds A. H. Scherer who retired. Mr. Becker joined IH as an apprentice toolmaker and has filled various manufacturing posts until his latest assignment.

Diesel Energy Distributor

Appointment of "Diesel, Air-Cooled of Michigan, Inc." as distributor for Deutz diesels has been announced by Diesel Energy Corp.

The firm will cover all of Michigan for distribution of Deutz air and water-cooled engines made by Kloeckner-Humboldt-Deutz AG of Cologne, West Germany.

This appointment is part of a nation-wide campaign to establish a network of distributors throughout the country. Warehouses have also been set up in key areas to speed delivery of spare parts.

(*Continued on Page* 71)

You Can't Beat This Alcoa Alloy Bearing!

"Very unlikely! Alcoa bearing alloy embeds well, resists scuffing and overheating. Also it's highly conductive, in many machines runs 20° cooler than other bearings."

"Alcoa bearing alloy is so good it's used for this compressor's main and crankpin bearings, too. And although bearing loads on compressors are well under 1000 psi, Alcoa alloy can take up to 10,000 psi where required."

"No other bearing metal has aluminum's unmatched combination of advantages. Get more information. Write: ALUMINUM COMPANY OF AMERICA, 1988-J Alcoa Bldg., Pittsburgh 19, Pa."

new literature

Westinghouse Catalogs Films

Forty-seven 12-mm sound films are reviewed in a booklet by Westinghouse Electric Corp. Films are catalogued according to subject—general interest, product information and training. All films listed are available to organized groups without charge.

Tractors In Action

Just issued is a booklet titled "Ford Tractors and Their Industrial Applications". Various models are illustrated on-the-job from special utility machines up to the husky Fordson Major diesel. Abbreviated specifications are included for all the Ford tractors.

ROCKFORD POWER TAKE-OFF SERVICE

These ROCKFORD DISTRIBUTORS and DEALERS carry a stock of clutches, power take-offs and replacement parts to insure ROCKFORD clutch users prompt delivery and service.

Lightbourn Equipment Company, Dallas 2, Texas
Rig Service Company, Houston, Texas
Mike Carter Engine Works, Wichita Falls, Texas
Carter Engine & Equipment Company, Abilene, Texas
Engine Service & Supply Company, Odessa, Texas
Oil Field Motor Service Company, Alice, Texas
Diesel Power Company, Oklahoma City, Oklahoma
Diesel Power Company, Tulsa, Oklahoma
United Engine Company, Shreveport, Louisiana
United Engine Company, Alexandria, Louisiana
Elms Equipment Company, Lubbock, Texas
Atlas Auto Parts & Grinding Company, Louisville, Kentucky
Auto Gear & Parts Company, Philadelphia 40, Pennsylvania
Brake & Clutch Service Company, Denver 2, Colorado
Auto Clutch & Parts Service, Inc., Chicago, Illinois
Blalock Machinery & Equipment Company, Atlanta, Georgia
Continental Sales & Service Company, Los Angeles 58, California
General Machine Parts Company, New York 51, New York
The Credle Equipment Company, Utica, New York
Genuine Motor Parts of Pennsylvania, Inc., Pittsburgh 13, Pennsylvania
Highway & Industrial Equipment Company, Inc., Raleigh, North Carolina
M. D. Moody & Sons, Inc., Jacksonville 7, Florida
Wepco Equipment Company, Cleveland 5, Ohio
Great Plains Motor Parts Company, Hastings, Nebraska
Delk's Engine & Supply Company, Great Bend, Kansas
R. Angus (Alberta) Ltd., Edmonton, Alberta, Canada
B-W-H Service Parts Limited, Merritton, Ontario, Canada

ROCKFORD CLUTCH DIVISION BORG-WARNER
1301 Eighteenth Avenue, Rockford, Illinois, U. S. A.

Trucks Through the Years

If you're interested in the development of trucks, you'll want a copy of the progress review presented by International Harvester. In it, IH traces the 50-year history of trucks from this first high-wheeled "auto wagon" down to its current line of motor trucks represented by this A-100 pickup model.

Specifications for the antiques are contrasted with the modern vehicles which range from 4200 to 96,000-lb gross weight.

Since 1907 IH has produced more than 2½ million trucks for every on- and off-highway use.

Tube Fitting Wall Chart

Parker steel fittings for connecting steel tubing lines are pictured and identified by part on wall chart No. 4300C3. Included are standard Triple-lok flare type, Ferulok flareless type and adapter fittings as well as a tube fitting size table.

Nordberg Four-Cycle Engines

The full line of Nordberg 4-cycle diesel, duafuel and spark ignition gas engines are thoroughly described in a new 16-page bulletin.

These in-line engines are built with a choice of specifications: 9-, 13- and 13½-in cylinder bore sizes; 6- and 8-cyl versions; turbocharged, turbocharged and intercooled; and Supairthermal units; range in hp from 640 to 2150.

Separate data sheets give horsepower ratings, outline drawings of engines and all dimensions required for preliminary planning.

Photographs and cross-section views show basic design and construction features of the Nordberg Supairthermal engine's bedplate, main frame, cylinder parts, pistons and valve lever assembly.

Applications and installations of the 4-cycle engines are also shown. Your copy of this catalog can be requisitioned on the postage-free card included in this magazine for your convenience.

new literature

Paint Problems?

Tip off your body man to this excellent manual on painting of vehicles. It's a really complete guide on refinishing by Rinshed-Mason Company. It covers every step and technique—from selection and proper use of equipment and paints, surface preparation, masking and sanding, application methods and safety rules. Each phase is carefully illustrated for easy duplication. Included is a 28-page reference section on trouble shooting.

Following this Rinshed handbook will insure quality paint jobs in less time at less cost. Every fleet supervisor should have a copy of this thorough Refinisher's Guide.

Round-up on Industrial Trucks

To be published this fall is a 94-page round-up of technical data on Powered Industrial Trucks. The handbook is the result of the combined efforts of various committees of the Industrial Truck Association.

Separate sections cover selection, procedures, operation and engineering data. The manual is said to be the most complete reference available on industrial trucks.

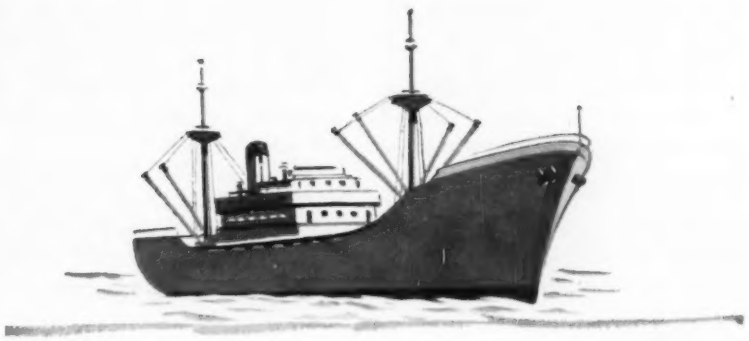
Orders can be placed direct with Industrial Truck Association, Ninth and F Sts., Washington 4, D. C.

Calibrating and Testing Fuel Pumps and Injectors

A new folder by Diesel Control Corp. gives details on their Universal Test Stands for diesel fuel injection systems. Illustrated, along with other models, is the basic U-4500 widely used for calbrating pumps and setting governors of all makes of injection equipment.

Some features reviewed are: Scientific glass graduates for discharge measurements with an accuracy of ½ of 1%. Eighty-pound flywheel creates balanced flow of power overcoming cam disturbance to governor while setting pump. Stroke counter is adjustable for automatic cut-off at any predetermined number of strokes. Worthington Allspeed drive simulates actual engine speeds from 150 to 3000 rpm.

Performance
is a matter of record!



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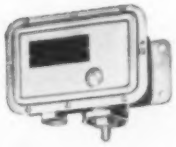

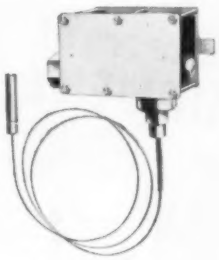

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From 30 inches of vacuum to 12,000 lbs. pressure, from −100° F. to +600° F. and up to 550V. AC-DC!

Detroit's D. T. Williams valves, such as No. 912 shown here, may be used for steam or hot water with pressures to 200 lbs., temperatures to 500° F.; or water, gas and air to 400 lbs. at 150° F.; for oil to 200 lbs. pressure at 250° F.

Consult with our sales engineer... or request Catalog No. 100 on Detroit Controls, Catalog No. 800 on D. T. Williams Valves.

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new literature

How Cat Helps Cut Down Time

Keeping down time to a minimum is the subject of two publications put out by Caterpillar Tractor Co.

"At Your Call" reviews the service Cat machine owners expect—and get—from Caterpillar dealers. It tells the steps they take to keep machinery on the move.

"Keep Them There" is the other booklet which explains how to keep earthmoving equipment on the job by proper maintenance and service.

Coal Storage Pointers

International Harvester has issued a 20-page textbook on handling loose coal around plants. Entitled "The Money-Saving Way to Stock-Out, Reclaim and Compact Coal", the book details the proper way to prepare an area to support a stockpile and the procedure to follow for profitable and safe stockpiling.

An equipment "select-o-graph" helps match units to the haul requirements in stockpiling and reclaiming. Appropriate units for short, medium and long hauls are suggested.

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Joseph Lucas (Canada) Ltd., Head Office: 11 Davies Avenue, Toronto 8, Ontario
Branch Office: 3401 St. Antoine Street, Montreal 30, Que.

A.P. 174817

Built-In Dirtproofing

In a new folder Cummins tells how they defeat damaging dirt by features incorporated in their engines. It reviews the dirt barriers they've set up in oil, air-reduction and fuel systems.

These dirtproofing accessories are available in kit form. Any Cummins distributor can convert models in the field in short order.

Protective Closures

Caps and plugs to seal, mask or protect equipment openings during assembly, storage, repair or transit are described in a leaflet by Shurclose Seal Company. Specifications are detailed for seven styles of rubber and plastic closures for threaded parts, pipe ends, tubing and other openings. Shurclose will also design special cap and plugs to your order.

Molybdenum Disulfide Lubricants

"Breaking Lubrication Barriers", covering the history and development of molybdenum disulfide lubricants, has been published by Alpha Molykote Corp. Among applications mentioned in the 16-page brochure are uses as concentrates in paste form, grease film lubrication, dry film lubrication and dispersions.

Self-Lubricating Bearings

Johnson Bronze Co. details their standard self-lubricating bearings in an easy-to-read bulletin. All items are carried in stock at 23 warehouses and by most of their industrial distributors throughout the country.

Termed Ledaloyl, these bearings are available as plain cylindrical, flanged and self-aligning spherical types.

Their built-in oil cushion gives protection against shock. The lubricant in the pores of the bearing is metered to the shaft when in motion—reabsorbed when at rest. An oil film between shaft and bearing prevents metal-to-metal contact. Johnson recommends these bearings where maintenance lubrication is difficult or neglected.

A handy decimal equivalent wall chart accompanies the bulletin on bearings.

new literature

Heavy-Duty Torque Converters

National torque converters for excavators, cranes and shovels are presented in the first of a new series of data sheets issued by National Supply Co.

Data Sheet No. 101 briefly explains 12 features of these single stage torque converters in operating heavy-duty machinery. Representative types and makes of engines with which the 17 sizes of National converters can be used in the 100- to 1000-hp range are listed.

Multi-Stage Centrifugal Compressors

A new technical bulletin on Series RS centrifugal compressors for gas processing work is announced by Cooper-Bessemer Corp. The 24-page piece gives complete construction details, cross-section view, engineering application data and dimensions.

RS compressors feature horizontally-split cast casings in capacities ranging from 1000 to 100,000 cfm. The bulletin is available by checking the post card inserted in this magazine.

Maintenance Data On Pre-Heaters for Diesels

KIM Hotstart Mfg. Co. offers a new maintenance manual on its electric pre-heaters for gasoline and diesel engines.

The 12-page guide covers regular inspection and servicing of KIM units which are widely used in transportation, trucking and construction industries. It also outlines a program for preventive maintenance to insure top efficiency and longer life. Exploded drawings of various models and informative data on replacement of elements are included.

KIM pre-heaters plug into any ac or dc outlet. The "motor-warmer" device draws cold water from the engine through the heater by a percolator-like action, then back into the engine.

Advantages cited are economies in warm-up time, reduced engine wear and maintenance and eliminating need for winter terminal storage.

Impact Wrench Calibrator

Skidmore-Wilhelm Mfg. Co. offers a bulletin on its impact wrench calibrator and tensile tester. It reviews uses of the calibrator in checking threaded fastener strength, calibrating and maintenance testing of power wrenches and for setting assembly torque standards.

Of special interest is a chart which gives ultimate strengths of standard screws in bolt sizes from 10-24 to 1¼-12, and in grades from low carbon steel to heat treated alloy steels.

Sanitary Landfill

Data on sanitary landfill methods, organization, operation and necessary equipment highlight an 8-page booklet issued by Allis-Chalmers. Photographs of equipment working on landfill and sketches showing how various methods are developed illustrate the new pamphlet.

For your copy of any of this data, use the postage-free card in the last section of this publication.

GET THE FACTS..

MAXIM

SILENCERS

Dimensions, installation data, applications, all packed into Maxim's informative data sheets. Find out about the *new* Maxim Exhaust and Intake Silencers . . . more compact, lighter, tough as ever, and at a *new* low cost.

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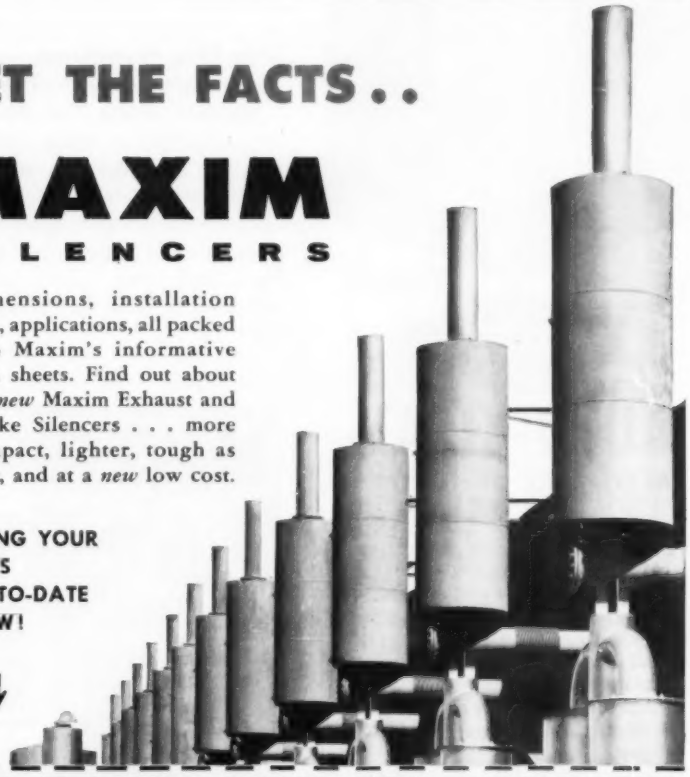

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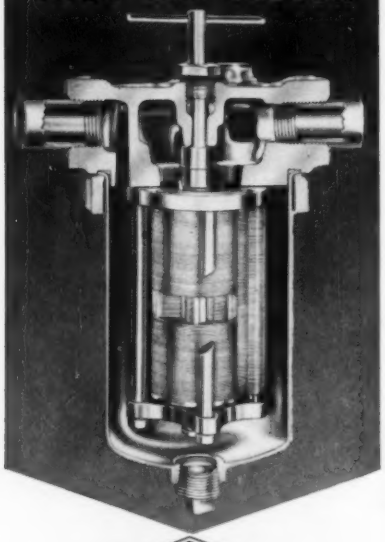

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- **HIGHER FLOW RATES IN SMALLER SPACE** . . . up to 300 gpm from a single unit only 40" in height.
- **FINER FILTRATION** . . . single or two-stage types with spacings to 40 microns and positive removal of contaminants.
- **POSITIVE SELF-CLEANING ACTION** . . . no interruption of oil flow.
- **PERMANENT ALL METAL CARTRIDGE** . . . eliminates replacement costs.
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FILTERS FOR DIESEL FUEL, LUBE OIL, AND COMPRESSED AIR. COMPLETE ENGINEERED FILTRATION SERVICE.

CUNO ENGINEERING CORP.
909 South Vine St., Meriden, Conn.
Filtration Engineers in Principal Cities

CUNO

news of our industry

(*Continued from Page* 55)

Cerlist Expansion

Cerlist Diesel, Inc. has established eleven dealer outlets for the JW-78 line of diesel air compressors manufactured in Austria expressly for this firm. This supplements the line of Cerlist's own lightweight, high-speed diesels now in production. These two-cycle, loop-scavenged engines were developed to power equipment where compactness and less weight are required.

Only Fifty Man-Hours To Produce Ferguson Tractor

Standard Motor Co., Ltd., Coventry, England, now manufacture its Ferguson "35" diesel tractor in about 50 man-hours.

The use of Heller in-line transfer machines for producing cylinder blocks and heads helped reach this record—a 33% increase in daily output.

Forty Mack Buses Added to Boston Fleet

Sales of 40 transit type buses to Eastern Massachusetts Street Railway Co. is reported by Mack Trucks, Inc.

Delivery of the new Thermodyne diesel buses will begin in late fall and bring this Boston firm's fleet to a total of 500 serving 74 communities.

With a 45-passenger capacity, the buses feature pressurized ventilation and Mack airglide suspension system for riding comfort.

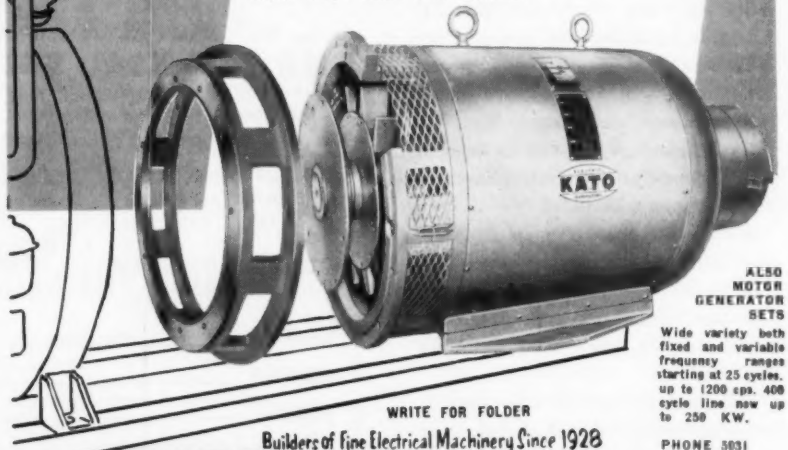
Diesel Still Going Strong After Nineteen Months

Under continuous operation for 19 months, a Perkins P6 industrial diesel worked 12,000 hours on a Canadian drilling project. It powered a Boyle BBS2 rig during 20,000 feet of drilling. The engine, rated 74 bhp at 2400 rpm, was still in good condition at the end of this job. Still had an estimated six months of service in her before an overhaul. That's a good operating record.

KATO GENERATORS
Fit The Engine Of Your Choice!

CHOICE OF FLEXIBLE COUPLINGS
Adaptable to ALL ENGINES with SAE Bell Housings

There is a size in the Kato line of generators with the electrical characteristics to meet your specific requirements. By means of one of Kato's flexible steel, disc-type or bonded rubber couplings, Kato generators easily connect to any diesel or gasoline engine. All standard frequencies . . . 25, 50, 60 and 400 cycles, plus many special frequencies to 1200 cycles (both fixed and variable). Now 400 cycles to 250 KW, 60 cycles to 500 KVA. One or two bearing designs. Extra lead wires brought out insure a maximum voltage selection. Single, standard two bearing, or two bearing close-coupled design. Special orders welcomed.



ALSO MOTOR GENERATOR SETS
Wide variety both fixed and variable frequency ranges starting at 25 cycles, up to 1200 cps. 400 cycle line now up to 250 KW.

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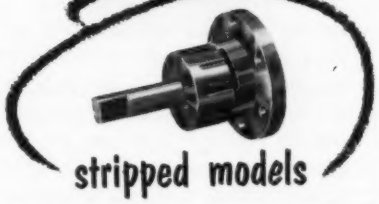
VIKING PUMPS
any way you want them

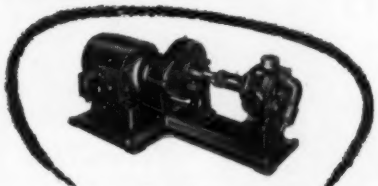


stripped models

The internal working parts of original "gear within a gear" Viking pumps are available to fit into your integral casing. Conserves space, piping arrangement, drive equipment, etc. Available in 2/3, 1-1/2, 3-1/2, 5, 10, 18 GPM and larger. Positive, self-priming, capable of handling all types of liquids up to several hundred pounds discharge pressure, in many models.

custom models

No matter how you wish to apply the positive self-priming Viking pump, it can be custom built in the size and casing design to fit your piping and drive arrangement. Thousands of individual problems have been successfully answered with specially designed Viking "Gear-within-a-gear" pumps.



standard models

Pick any standard Viking pump in 21 sizes from 2/3 to 1050 GPM, in many types of mounting and drive arrangements. They are available from over 750 cataloged models.

Send your pumping problem today and ask for bulletin 57Sd.

VIKING PUMP CO.
Cedar Falls, Iowa, U.S.A.

In Canada, it's "*ROTO-KING*" pumps

See our catalog in Sweets Industrial Construction and Plant Engineer's File.

news of our industry

AERA Moves

New address of Automotive Engine Rebuilders Association is now 9 North Illinois St., Indianapolis 4. With these larger quarters and additional personnel, the AERA hopes to better serve their increased membership.

A-C Production Not Stymied by Tornado

Rumors had it that some manufacturing facilities of Allis-Chalmers were destroyed in the tornado which hit Springfield, Illinois. It isn't so. One building was damaged but this served as their training center for the Construction Machinery Division.

Now the sales and service schools are being conducted in Sherman, Ill. The Technical Publications Section of the damaged building remains intact. So despite the twister, business is going on as usual at A-C.

Diesel Helps Rescue Miners

A huge, diesel-powered auger played the hero's role in the rescue of five miners. They were trapped when a section of horizontal mine shaft collapsed beneath a hill at a Powhaton Mining Co. pit in southern Ohio.

This dramatic story has a happy ending because a 38-ton auger was able to drill a large hole through 236 ft of earth to reach the entombed men.

Rescuers worked frantically but all efforts failed. Then the idea of drilling through the side of the hill struck the mine superintendent. The auger was moved to the bottom of the hill on the long-shot chance of hitting through to the trapped miners. Twelve bits—drilling a 42-in. hole—were used in sequence to get to the men.

The Compton machine was powered by a Cummins NHRS-6 diesel for auger power and a Cummins "A" engine for auxiliary power. It cut a hole into the hill at an average rate of 2½ ft per minute.

Success of the operation depended on the capacity of the diesel-powered machine and the accuracy of the rescuers in aiming the drilling head at the trapped men.

Just one idea from this new Oakite Report may save you plenty!

—and its chock-full of ideas on maintenance cleaning in power plants.

This new, free, illustrated Oakite Service Report has valuable how-to information on such typical operations as:

- Cleaning heat-exchange equipment
- Descaling and derusting
- Cleaning air filters
- Paint stripping
- Cleaning motors, switch boxes
- Steam-detergent cleaning
- General maintenance cleaning

IT'S FREE! Ask your local Oakite man for a copy of Oakite Service Report B6800, or write to Oakite Products, Inc., 22C Rector Street, New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING
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MATERIALS · METHODS · SERVICE
SCIENCE

Export Division Cable Address: Oakite

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new products

(*Continued from Page 59*)

Direct-Fired Steam Cleaners

Kelite Corporation presents three new direct-fired steam cleaners.

Mark I, designed for light to medium duty, has an output of 120 gph. Mark II, for medium to heavy duty, has a 200-gph output. Mark III, with an output of 300 gph, is designed for maximum duty. Output of all three Kelite steam cleaners is rated at 320°F.

Each of the new cleaners provides a positive displacement piston pump capable of delivering its full rated output hundreds of feet from the machine. An efficient water-wall heat exchanger provides maximum fuel economy and a gas or oil burner gives instant starting.

Standard equipment on all Kelite cleaners includes a heavy-duty steam cleaning gun with swivel-type rear grip and a forward grip aerated for cool operation; a high velocity spray nozzle, and heavy duty hose.

For Joining Aluminum

Two new soldering materials have been developed by Alcoa—Solder No. 805 and Soldering Flux No. 66.

The solder—95% zinc and 5% aluminum—has a melting range of 715° to 725°F. It will join all aluminum alloys and make joints between aluminum and other metals such as copper, steel and nickel. Use of this solder will make practical a greater variety of aluminum applications.

Recommended for use with the solder is Flux No. 66. It can be applied dry or in propyl alcohol solution. It reacts to 720°F to wet aluminum with zinc. Any method of heating can be used with both solder and flux.

Heat-Resistant Paints

Reported by Chem Industrial Co. is the addition of three new colors to its line of C-1 heat-resistant paints for use on mufflers, exhaust lines and other components. Formerly offered only in aluminum, C-1 "Extra High" now comes in gold, metallic red and metallic blue. All four hues are said to resist temperatures up to 1700° F without flaking, blistering or burning.

The paint is made of a clear silicone base with a special metallic pigment. This combination air dries to a bright finish in about 30 minutes. When heated, it is said to virtually fuse with the surface to which it is applied. According to the maker, this paint forms a metal coating which resists moisture, corrosion, mild acids, alkalis and industrial fumes.

Quick starts down to

65 DEGREES BELOW ZERO

for Diesel and gasoline engines

SPRAY STARTING FLUID, with the propellent used in the pressurized can, insures quick starts for Diesel and gasoline engines in temperatures as low as 65° F. below zero and withstands 180° F. heat. This combustible propellent was developed after two years of research. SPRAY STARTING FLUID pressurized with our inert propellent is absolutely safe and odorless in storage.

SPRAY STARTING FLUID is sold through distributors, wholesalers and their dealers located throughout the United States and Canada.

SPRAY PRODUCTS CORPORATION

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GRIND CRANKSHAFTS IN THE BLOCK!
The Winona Lateblok Crankshaft Grinder has given fast, accurate service in the Automotive field for over 18 years. Now it's available to the Diesel field. With a new large hook, the standard grinder will now grind shafts up to 3½" in diameter in the block!
WRITE FOR DESCRIPTIVE LITERATURE AND PRICES.
WINONA TOOL MFG. CO.
WINONA, MINN. U.S.A.

organizational news

(*Continued from Page* 63)

Paul J. Every

Cummins Manager Transferred To Scotland Plant

Paul J. Every has left to take over duties as managing director of the Cummins Engine Co., Inc. subsidiary in Shotts, Lanarkshire, Scotland.

Mr. Every had been Cummins general sales manager at Columbus, Indiana. He joined the firm ten years ago after being employed by Baldwin Locomotive.

At the Shott's plant, Cummins is manufacturing high speed, high horsepower diesels in the 200- to 335-hp range for use in earthmoving and industrial units, rail cars and marine units.

Mr. Every succeeds D. J. Cummins who has returned to the parent plant to resume his responsibilities as vice president of engineering.

Shifts at A-C

Harold G. Zambell is now engineer-in-charge of test and development at Allis-Chalmers Terre Haute Works. With A-C for 15 years, he holds BS and MS degrees in electrical engineering from MIT and is active in the AIEE.

William C. Farneth succeeds Mr. Zambell as engineer-in-charge of development at the company's Pittsburgh Works. Mr. Farneth has served A-C for a number of years and is an electrical engineering graduate of the University of Pittsburgh.

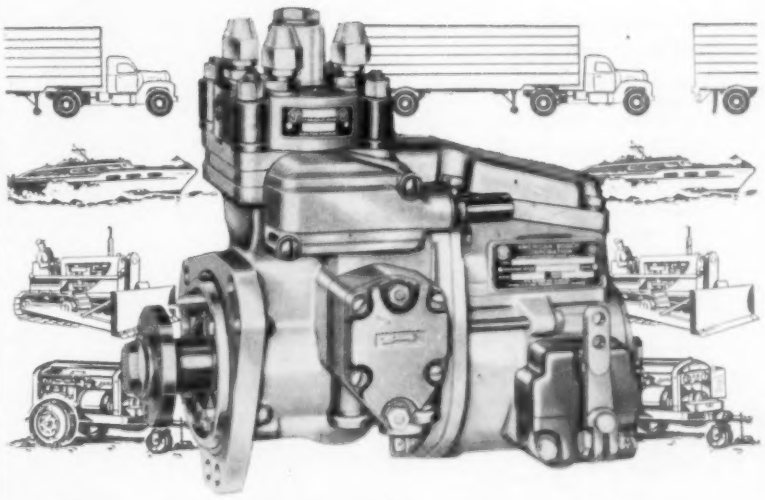
Another appointment is that of Harry A. Wright as manager of product sales of the control department. Mr. Wright joined Allis-Chalmers in 1937 and has served in various engineering capacities. He is an electrical engineering graduate of Carnegie Institute of Technology.

News from American MARC

The newly formed Electro-Dynamics Division of American MARC, Inc. has been awarded its first business. Contracts totaling $809,000 for static exciter and conventional generators were placed for use by U. S. Army Corps of Engineers and the Marine Corps.

Heading this new Division is Wilson H. Bucknell, until recently chief engineer of O'Keefe & Merritt Co. While with that firm, Mr. Bucknell was responsible for development and production of the 15-kw permanent magnet generator used by the U. S. Marine Corps.

Also announced by American MARC is the appointment of Lloyd E. Berry as vice president of sales. Previously Mr. Berry was distributor of the company's line in Houston. He now plans to set up six regional sales divisions and five parts warehouses to provide efficient distribution throughout the U. S.



Key to top performance . . .
the PSB fuel injection pump

The PSB Fuel Injection Pump has established an unmatched record for dependable and economical diesel engine performance.

Proven design—here's a fuel injection pump with fewer parts and simple construction, employing positive governor control and a replaceable hydraulic head for fast field servicing.

Outstanding operating economy—from precise fuel metering and accurate distribution . . . the PSB Fuel Injection Pump's efficient design and careful manufacture assure long, trouble-free operation with minimum maintenance.

Backed by low-cost repair service—from "original-maker" repair by factory-trained experts at Authorized American Bosch Service Stations . . . nearly 200 in North America, Hawaii, and Puerto Rico . . . all equipped with special tools and test equipment, and stocked with genuine American Bosch replacement parts.

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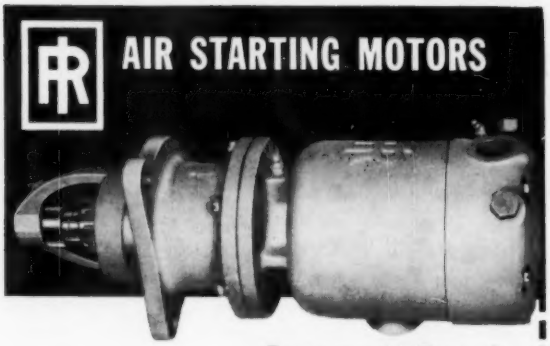

Ingersoll-Rand

5BM for smaller engines

eliminate weight and costs of starting batteries and generators

Dependability: fast, positive starts regardless of temperature. Proven performance. Made by the originators of Air Starting Motors.

Low Cost: compact I-R Air Starting Motors are small, powerful, easily installed. Low maintenance costs throughout long, trouble-free life.

Three Sizes: 5BM, 9BM and 20BM Air Starting Motors meet requirements of complete range of heavy-duty internal combustion engines.

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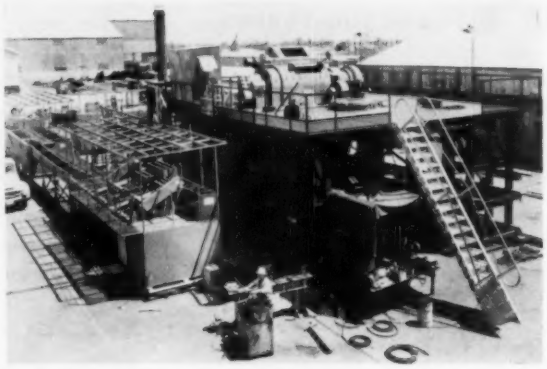

Drilling Rigs Bound for Africa

Here being rigged up for testing prior to shipment to Nigeria, is one of two Cummins-driven drilling rigs. They were purchased by Drilling & Exploration Company.

Each rig is a National Type 80-B with a 4-section drive group, powered by four Cummins diesel with a National MS-20½ rotary. The unit includes three slush pumps, one independently powered. Pipe will be suspended from a 142-ft mast, using a National Type 542-E-200 hook-block, N-815 swivel and Type D anchor. The sub-structure is 14 ft high.

Each rig-up required about 14 days, and included the placing of mud, water, air and oil lines, as well as complete erection of major components.

FREE to Every Shop Operator

BACHARACH
DIESEL SHOP MANUAL
FOR
AUTOMOTIVE DIESEL ENGINES
BULLETIN AD54

76 Pages—275 Illustrations
56 Engine Reference Tables
26 Parts Lists

- Diesel Compression Testers
- Nozzle Testers for American Bosch, Caterpillar and Bendix Nozzles
- Cummins Injector Tester
- International Harvester Injection Testers
- General Motors Injector Testers
- Injection Pump Calibrating Stands
- Nozzle-Injector Cleaning Tools and Lapping Blocks
- Engine Overhaul Stands
- Engine Removal and Parts Dollies
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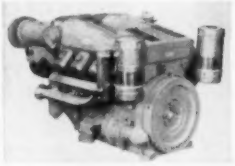

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news of our industry

(*Continued from Page 69*)

Brazil RR Replaces Steam Units

General Motors Diesel Ltd., London, Ontario, has completed an order from the Mogiana Railway, Brazil, for 25 Model G12 diesel-electric locomotives. These 1425-hp units will replace more than twice their number of aged, wood-burning steam locomotives. The replacement units will eliminate non-profit transport of firewood which now accounts for 25% of the railway's tonnage.

Hose Fitting Rights Licensed

Aeroquip Corporation has concluded a licensing agreement granting Weatherhead Company rights to produce and sell fittings in the United States and Canada for Teflon hose assemblies under Aeroquip patents.

The agreement covers application in airborne and Government equipment. Weatherhead, in turn, will give Aeroquip rights to use certain patents on Teflon hose fittings.

GE Locomotives Headed For Chile, India and Turkey

Over $2 million worth of GE diesel-electric locomotives have been ordered by two steel companies in India. These contracts reflect current expansion of heavy industry in that country.

State-owned Hindustan Steel Co. purchased 20 locomotives powered by Cummins NHBIS-600, 275-hp diesels. Indian Iron & Steel Co. contracted for five units with the same Cummins engines.

Because the units will operate in temperatures ranging up to 120°F, 100% humidity and under extreme dust conditions, all will be fitted with air filters to the engine cab and traction motors.

Also reported by General Electric was shipment of the first standardized export locomotive destined for Chilean State Railways. The unit is the new Model U9C universal type 990-hp diesel-electric and will be used for narrow-gage mainline passenger and freight service.

GE reports, too, the sale of five universal type 1980-hp diesel-electric locomotives to the Turkish Government by Pan American Investment, Inc. This order is the initial part of an extensive program to modernize Turkey's railroads.

Petroleum Division, ASME, Engineering Conference

Engineers will gather at the 12th Annual Conference of the Petroleum Division, ASME, at Tulsa on Sept. 23-25.

All phases of petroleum problems are on the agenda. Technical papers and panel discussions will deal with such topics as automatic production and processing techniques and offshore drilling methods. Up for consideration, too, are the ways and means of getting more mileage from the limited supply of available engineering talent.

Special luncheon meetings will be devoted to exchanging ideas on the five branches of the petroleum industry—materials, refining, manufacturing, transportation and production.

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Service Section

Common Lube Oil System For CAT

(*Continued from Page* 51)

the beating effect of the weight of the starting engine crankshaft and flywheel on the starting engine bearings.

When the diesel is running, oil is pumped from it to the starting engine by the diesel engine oil pump. Oil enters the starting engine through a passage in the cylinder block near the timing gear cover. Oil can accumulate in the starting engine oil pan until it reaches the level of a standpipe which is cast integrally with the oil pan. Excess oil is then drained back to the diesel by way of a cored passage in the starting engine rear support.

With only the starting engine operating, lubrication for it is provided by its oil pump. A check valve prevents oil starvation of the starting engine by closing off the oil supply line from the diesel.

There is a drilled passage to allow oil to flow freely between the starting engine crankcase and its clutch. The breather on the starting engine clutch compartment as well as that on the timing gear compartment have been eliminated.

The new oil pan for the starting engine, in addition to having a cast-in standpipe to retain sufficient lubrication for starting, is designed to assure an ample oil supply for starting on a slope.

Coolant Filter and Conditioner On GM "71"

The coolant filter and conditioner properly conditions the cooling water by preventing galvanic action, scale, corrosion and acid action. Consequently, a corrosion inhibitor is not required when an engine is equipped with a coolant filter and conditioner. However, such units do require a permanent type antifreeze during the winter to prevent the engine coolant from freezing.

It is recommended that the filter cartridge be renewed every 300 to 500 hours of operation during the summer. When the system is filled with a permanent antifreeze, the filter cartridge in the system, regardless of the number of hours it has been used, and as long as it is not plugged, should be retained until the anti-freeze solution is removed.

The dichromate in a new filter may react with the ingredients in the permanent antifreeze solution and form deposits which could clog the water passages. The dichromate in a used filter would be almost exhausted at the time the summer coolant is being drained in preparation for winterization.

By retaining the used filter cartridge in the system, harmful deposit formation is prevented and the protection of a cooling system filter is retained.

If the filter becomes plugged during winterized operation, it is suggested that the filter cartridge be removed from the system and the unit operated without a filter until the antifreeze solution is removed.

Under Size Bearings For Cat Starting Engines

In addition to the standard and 0.030-in. undersize front and rear main bearings, 0.020-in. undersize main bearings are now available for the 25-hp vertical starting engine used on D7, D8, D9, DW15, DW20 and DW21 Tractors, No. 583 Pipelayer and D326, D337, D339 and D342 engines. The two sizes of undersize bearings now available make it possible to obtain greater crankshaft service life.

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ADVERTISERS' INDEX

AiResearch Industrial Div., Garrett Corp., The ... ***
Air Maze Corp., The ... 8
Albertson & Co. ... ***
Allis-Chalmers Mfg. Co. ... 2
Aluminum Co. of America ... 62, 63
American Air Filter Co. ... 26
American Bosch Div., American Bosch Arma Corp. ... 71
American M.A.R.C. ... 60
Amot Controls Corp. ... ***

Bacharach Industrial Instrument Co., Inc. ... 72
Beard & Stone ... 77
Bell Diesel Research ... 76
Bendix Aviation Corp., Eclipse Div. ... 75
Bendix Aviation Corp., Scintilla Div. ... 15
Borg-Warner Corp., Rockford Clutch Div. ... 64
Bosch, Robert Corp. ... ***
Briggs Filtration Co., The ... ***
Brush Aboe Inc., Petter Engine Div. ... 72
Burgess Manning Company ... 61

C.A.V. Ltd. ... 66
Chicago Pneumatic Tool Co. ... ***
Cities Service Oil Co. ... 11
Clark Equipment Co. ... ***
Clayton Mfg. Co., Dynamometers Div. ... ***
Cleveland Hone & Mfg. Co. ... ***
Clevite Service Div., Cleveland Graphite Bronze Co. ... ***
Commercial Filters Corp. ... 17
Connell Co., W. J. ... 77
Cook, C. Lee Co. ... ***
Cooper-Bessemer Corp. ... ***
Cuno Engineering Corp. ... 68

De Laval Steam Turbine Co. ... ***
Delco-Remy, Div., General Motors Corp. ... ***
Detroit Controls Corporation ... 65
Detroit Diesel Engine Div., General Motors Corp. ... ***
Diesel Fuel Injection Service Co. ... 77
Diesel Injection Sales & Service, North Carolina ... 77
Diesel Parts Co. of California, (SACO) ... ***
Diesel Plant Specialties ... ***

Eaton Mfg. Co. ... Third Cover
Eclipse Div., Bendix Aviation Corp. ... 75
Electro-Motive Div., General Motors Corp. ... ***
Elliott Company ... 4
Engine Life Products Corp. ... ***
Enterprise Engine & Machinery Co. ... ***
Erie Forge & Steel Co. ... ***

Fairbanks, Morse & Co. ... ***
Florida Diesel Service Co. ... 77
Fram Corp. ... ***
Fulton-Sylphon Div., Robertshaw-Fulton Controls Co. ... 59

Garrett Corp., The AiResearch Industrial Div. ... 10
General Motors Corp., Delco-Remy Div. ... ***
General Motors Corp., Detroit Diesel Engine Div. ... ***
General Motors Corp., Electro-Motive Div. ... ***
General Motors Corp., Harrison Radiator Div. ... 7
Gillett & Eaton, Inc. ... ***
Greenlee Bros. & Co. ... ***
Groban Supply Company ... 76

Hancock Diesel Service Co. ... 76
Harrison Radiator Div., General Motors Corp. ... 7
Hartford Machine Screw Co. ... ***
Hercules Motors Corp. ... ***
Hilliard Corporation, The ... ***
Houdaille Industries Inc., Manzel Div. ... ***

Illinois Testing Laboratories, Inc. ... 16
Ingersoll-Rand Co. ... 72
International Harvester Co. ... ***
International Nickel Co. ... ***
Interstate Diesel Service, Inc. ... 77

Johnson Bronze Co. ... ***

Kato Engineering Co. ... 68
Kent-Moore Organization, Inc. ... ***
Kiene Diesel Accessories, Inc. ... 61
Kim, Hotstart Mfg. Co. ... 60
Kittell Muffler & Engineering Inc. ... ***
Koppers Co., Inc. ... 20

Longor, Inc. ... ***
Luber-Finer, Inc. ... ***

Magneto Ignition Co., Inc. ... 77
Manzel Div., Houdaille Industries, Inc. ... ***
Maschinenbau, Kiel, Aktiengesellschaft (MAK, Kiel, Germany) ... ***
M.A.N. Maschinenfabrik Augsburg-Nurnberg (A.G. Augsburg, Germany) ... 24, 25
Maxim Silencer Co. ... 67
Mechanical Engineering Co. ... 77
Minneapolis-Honeywell Regulator Co. ... 13
Morco, Inc. ... ***

Napier & Sons, Ltd. ... ***
National Forge & Ordnance Co. ... 58
Nordberg Mfg. Co. ... ***
Norris R. S. & Associates ... ***
Nugent, Wm. W. & Co. ... 55

Oakite Products, Inc. ... 69

Pacific Diesel Parts Co. ... ***
Park Drop Forge Co., The ... ***
Peninsular Engineering & Sales Co. ... 77
Perfect Circle Corp. ... ***
Petter Engine Div., Brush Aboe, Inc. ... 72
Purolator Products, Inc. ... 21

Quincy Compressor Co. ... ***

Robertshaw-Fulton Controls Co., Fulton Sylphon Div. ... 59
Rockford Clutch Div., Borg-Warner Corp. ... 64

Schwitzer Corp. ... ***
Scintilla Div., Bendix Aviation Corp. ... 15
Sealed Power Corp. ... 28
Sharples Corp. ... ***
Shell Oil Co. ... 19
Snap-On Tools Corp. ... 54
Spray Products Corp. ... 70
Standard Oil Co., Inc. (California) ... 6
Standard Oil Co., Inc. (Indiana) ... Fourth Cover
Sturtevant, P. A. Co., The ... ***
Surrette Storage Battery Co. ... 76
Synchro-Start Products Corp. ... ***

Texas Company, The ... 2nd Cover & 1
Thomas Flexible Coupling Co. ... ***
Thompson Products, Inc., Jet Div. ... 22
Tobin-ARP Manufacturing Co. ... ***
Treanor Corp. ... ***
Tuthill Pump Co. ... 23
Twin Disc Clutch Co. ... ***

Unex Products Corp. ... 77
United Engine & Machine Co. ... 53

Van Norman Automotive ... ***
Vellumoid Co. ... 76
Viking Instrument Co. ... ***
Viking Pump Co. ... 69

Waukesha Motor Co. ... 14
Westinghouse Electric Corp. ... 18
White Diesel Eng. Div., White Motor Co. ... ***
Wilkening Manufacturing Co. ... 9
Winona Tool Mfg. Co. ... 70
Winslow Engineering & Mfg. Co. ... ***
Woodward Governor Co., Inc. ... 3
Worthington Corp. ... ***
Wyman-Gordon Company ... 12

Young Radiator Company ... 57

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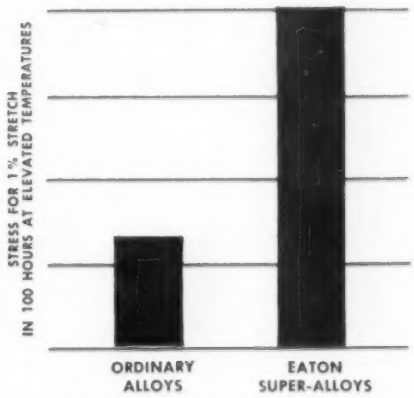

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